EXPERIENCE INNOVATION

MODEL NUMBER: 3T – DKW – KD400 SERIAL NUMBER: 3T - XXX

Before starting this pump, read this instruction manual carefully.

This pump has been thoroughly tested before delivery, and the performance has been checked and certified within acceptable limits.

This manual is considered a permanent part of your pump. It must be available to all operators of the pump and should remain with the pump if resold.

If the instructions for use and maintenance are observed, the pump will give full performance for a long time. This manual also contains information for the prevention and elimination of most common operating problems.

In event of difficulty, contact our service representative, who will be able to resolve any particular problems that may arise.

CALIFORNIA

Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Please note that to receive warranty coverage, the pump unit must be registered for warranty upon receipt by the owner**.** Please provide the information requested on the form included at the back of this document.

To ensure rapid delivery of parts, or to resolve difficulty with the pump, all requests should be as complete as possible, and include the following information, as a minimum:

Model Number: _3**T–DKW–KD400** Unit Serial Number: _____
Type of Pump: **3" Aluminum Trash Pump** Serial Number _____
Reference Number of the spare part: _____
Description of the spare part: _____

The information and specifications in this publication were in effect at the time of approval for printing. The manufacturer reserves the right to discontinue or change specifications or design at any time without notice and without incurring any obligation whatever.

TABLE OF CONTENTS

PRECAUTIONS 5
EFFECTS OF COLD WEATHER ON DIESEL ENGINES 7
DO'S AND DON'TS 9
PUMP SAFETY 10
ENGINE SAFETY 11
COMPONENTS

- IMPELLER 15
- MECHANICAL SEAL 15
- CHECK VALVE 15

DESCRIPTION OF OPERATION

- CENTRIFUGAL PUMP 16
- DIESEL ENGINE 16

BEFORE OPERATION

- IS YOUR PUMP READY 17
- CHECK THE GENERAL CONDITION OF THE PUMP 17
- CHECK THE ENGINE 17
- CHECK THE PUMP SUCTION AND DISCHARGE HOSES 17

OPERATION

- SAFE OPERATING PRECAUTIONS 19
- SUCTION HOSE CONNECTION 19
- DISCHARGE HOSE CONECTION 19
- STARTING THE PUMP 19
- SET IDLE (LOW SPEED) STOP 21
- SET HIGH SPEED STOP 21
- ADJUSTING ENGINE SPEED 22
- IMPORTANT CHECKS DURING OPERATION 22
- STOPPING THE ENGINE 23

SERVICING THE PUMP

- MAINTENANCE 24
- THE IMPORTANCE OF MAINTENANCE 24
- MAINTENANCE SAFETY 24
- SAFETY PRECAUTIONS 24

DIESEL ENGINE PREVENTIVE MAINTENANCE 25

AIR CLEANER ELEMENT 26
ENGINE OIL CHECK 26
INSPECTION AFTER INITIAL 50 HOURS OF OPERATION 26
ENGINE OIL CHANGE 26
INSPECTION EVERY 150 HOURS OF OPERATION 28
ENGINE OIL CHANGE 28
DRAIN FUEL TANK 29
REPLACE FUEL FILTER 30
REPLACE AIR CLEANER ELEMENT 30
CHECK TORQUE OF ALL NUTS AND BOLTS 30
CHECK AND CLEAN COOLING FINS 30
INSPECTION EVERY 1000 HOURS OF OPERATION 31
CHECKING AND ADJUSTING FUEL INJECTION VALVE 31
ADJUSTING INTAKE / EXHAUSE VALVE CLEARANCES 31
LAPPING INTAKE / EXHAUST VALVES 31
CHECK AND ADJUST FUEL INJECTION TIMING 31
TESTING THE VOLTAGE REGULATOR 31

PUMP SERVICE 32

PUMP CHAMBER FLUSHING 33
GREASE THE MECHANICAL SEAL 33
REPLACING THE MECHANICAL SEAL 33
REPLACING THE WEAR PLATE 35
REPLACING THE SUCTION FLAPPER 36

PUMP TROUBLE SHOOTING 37
COMMON DIESEL PROBLEMS 39

3 EXPLODED VIEW 43
3 SPARE PARTS LISTING 44
3T RECOMMENDED SPARE PARTS 44
3T PUMP CURVE 45

SAFETY MANUAL 46
WARRANTY 54
BILL OF MATERIALS 56
PARTS ORDER FORM 57
MANUAL REGISTRATION FORM 58
THOMPSON PUMP MANUFACTURING CONTACT LIST 59
WARRANTY REGISTRATION FORM 61

PRECAUTIONS

DO NOT OPERATE the pump without all covers/guards in place.

Never remove any cover plate or drain plug from any overheated pump. Allow the pump to cool prior to adding any fluids.

Prior to starting:

- ☑ Check all fluid levels within normal levels.
- ☑ Ensure all covers/guards are in place.
- ☑ Locate pump on a surface which will not cause it to tip, roll, slide, or fall.
- ☑ Exhaust fumes can kill. **DO NOT OPERATE** the engine in a confined or enclosed space without adequate ventilation.

Operating Problems (may affect emissions)

If you are aware of any of the following symptoms, have your engine inspected and repaired by your servicing dealer.

Hard Starting or Stalling after Starting
Rough Idle
Misfiring or Back firing under Load
Runaway Diesel (keeps running after key is turned off)
White or Black Exhaust Smoke
High Fuel Consumption

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen are very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Prior to shutdown:

- ☑ Reduce the RPM to minimum
- ☑ Allow for the engine to cool
- ☑ Shutdown the engine (per applicable procedure)

Do not allow the pump to sit idle for long periods with water in the pump casing.

Below 15°F, wax crystals begin to form in diesel fuel. These will clog the fuel filter and stop the engine as the temperature drops toward 0°F. Any good "winter fuel conditioner" for diesel fuel will keep the fuel moving to at least -20°F. Follow the instructions on the bottle!

If the fuel has already gelled due to the cold:

The time proven remedy is to add a gallon of kerosene for each 10 to 20 gallons of fuel to the tank, then allow it to sit long enough for the kerosene to diffuse into the fuel. In weather below -20°F, one gallon of kerosene for 10 gallons of fuel will keep things moving, but fuel economy will be reduced.

Apply heat to the fuel filter to break up the wax.

DO NOT USE OPEN FLAME TO HEAT THE FUEL FILTER.

Minimizing the Effect of Cold Weather on Diesel Engines

Diesel engines are designed to operate effectively in cold weather.

However, for effective starting and cold weather operation, a little care is necessary. The information below outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. Contact your servicing dealer for additional information, and local availability of cold weather aids.

Use Grade No. 1-D Fuel

When temperatures fall below 5°C (40°F), Grade No. 1-D Fuel is best suited for cold weather operation. Grade No. 1-D fuel has a lower cloud point and a lower pour point.

> Cloud Point – the temperature at which wax will begin to form in the fuel and this wax causes fuel filters to plug.
>
> Pour Point – the temperature at which fuel begins to thicken and becomes more resistant to flow through fuel pumps and lines.

NOTE: On an average, Grade No. 1-D fuel has a lower BTU (heat content) rating than Grade No. 2-D fuel. When using Grade No. 1-D fuel, you may notice a drop in power and fuel efficiency, but should not experience any other engine performance effects. Check the grade of fuel being used before troubleshooting for low power complaints in cold weather operation.

Seasonal Viscosity Oil and Proper Coolant Concentration

Use seasonal grade viscosity engine oil based on expected air temperature range between oil changes and a proper concentration of low silicate antifreeze as recommended. (See Diesel Engine Oil and Engine Coolant Requirements)

DIESEL FUEL FLOW ADDITIVE

IMPORTANT: Treat the fuel when outside temperature drops below 0°C (32°F). For best results, use with untreated fuel. Follow all instructions recommended on the label.

DO'S AND DON'TS

DO:

1. Consult the engine & pump manufacturer's instructions before starting the unit
2. Follow all safety, health & environmental rules and procedures.
3. Make sure all guards and shields are in place and secured before starting engine.
4. Ensure that the pump is level, stable and secure before starting.
5. Fill pump with water before starting.
6. Ensure wear-plate & impeller are in good condition. Impeller to wear-plate gap should be between .015" - .030".
7. Keep suction lift to a minimum and support all hoses & piping as needed.
8. Check fuel supply – verify adequate fuel level & check for contamination.
9. Tighten all suction connections properly - use pipe compound or Teflon tape.
10. Use only good hose gaskets and good quality, reinforced suction hose.
11. Use a trash strainer or foot valve when open pumping and keep it clean and free from obstructions.
12. Avoid air traps in the suction & discharge lines and make sure that suction line is designed with a slight slope to the pump.
13. Follow the maintenance schedule as specified in the manual.
14. Drain the pump and all hoses & piping during extended periods of non-usage or during freezing weather.

DON'T:

1. Allow inexperienced personnel to operate equipment unless they are supervised.
2. Forget safety, health & environmental precautions.
3. Attempt suction lifts over twenty-five feet.
4. Allow impeller & wear-plate to wear excessively creating a large gap.
5. Allow the suction line to become clogged or mired in mud.
6. Forget to grease mechanical seal as prescribed in manual.
7. Lift the pump with suction or discharge hoses attached.
8. Operate the pump at an excessive angle of inclination.
9. Allow the unit to run out of fuel.
10. Run the engine faster or slower than the recommended operating speed range.
11. By-pass or disconnect any safety shutdown switches or gauges.
12. Neglect periodic service and maintenance.
13. Perform any service or repairs while the engine or the pump end is running or is hot.
14. Operate the unit while a discharge valve is closed or the discharge line is obstructed.

RULE OF THUMB

Diesel fuel will expand if left unattended in the hot sunlight. This expansion of fuel is approximately 0.5 gallons for a 100 gallon tank that the temperature has risen 10 degree's Fahrenheit. The standard fuel neck will hold approximately 0.25 gallons from the top of the screen to the top of the filler neck. It is, therefore, not recommended to fill the tank above the screen in the filler neck, and in areas where the temperature change is high over the course of the day, it is recommended to leave enough room in the tank for the corresponding expansion.

PUMP SAFETY

It is the operator's responsibility to provide the necessary safeguards to protect people or property in the vicinity of this pump. The operator must be familiar with the controls, in order to be able to stop the pump in event of an emergency. This pump contains safety devices to help ensure the safe operation, and these devices should only be removed by a qualified servicing mechanic.

Personnel assigned for operating, inspecting, maintaining and installing the pump should have the correct qualifications to carry out the work in question. If a member lacks the necessary knowledge, he/she should be trained, or given a refresher course. If necessary, this can be arranged by Thompson Pump Mfg., at the request of the owner of the equipment.

Following the instructions contained in this manual will prevent occurrence of most common accidents.

This pump is designed to pump liquids, including muddy water, water containing solids, and non-potable liquids. It is not designed to pump potable (drinking) water, and should never be used for this application.

Pumping flammable liquids, such as gasoline, can result in a fire or explosion, resulting in serious injury, or death.

Pumping chemical solutions, such as acids, or pumping salt water (such as seawater) can result in corrosion to the pump internals, resulting in damage to the pump.

This pump is designed to be operated on level ground, to avoid spillage of any oil or fuel from the pump engine.

All forms of warranty will cease to apply if the safety instructions are not observed. The non-observance of the safety regulations and operating instructions will also lead to all forms of warranty ceasing to apply.

WARNING SYMBOLS

These are the warning symbols which are used in this manual.

WARNING – Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

CAUTION – Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

SAFETY INSTRUCTIONS

Lombardini engines are built to provide safe and long-lasting performances, but in order to obtain these results it is essential that the maintenance requirements described in the manual are observed along with the following safety recommendations.

The engine has been built to the specifications of a machine manufacturer, and it is his responsibility to ensure that all necessary action is taken to meet the essential and legally prescribed health and safety requirements. Any use of the machine other than that described cannot be considered as complying with its intended purpose as specified by Lombardini, which therefore declines all responsibility for accidents caused by such operations.

The following instructions are intended for the user of the machine in order to reduce or eliminate risks, especially those concerning the operation and standard maintenance of the engine.

The user should read these instructions carefully and get to know the operations described. By not doing so he may place at risk his own heath and safety and that of anyone else in the vicinity of the machine.

The engine may be used or mounted on a machine only by personnel suitably trained in its operation and aware of the dangers involved. This is particularly true for standard and, above all, special maintenance work. For special maintenance, contact personnel trained specifically by Lombardini. This work should be carried out in accordance with existing literature.

Lombardini declines all responsibility for accidents or for failure to comply with the requirements of law if changes are made to the engine's functional parameters or to the fuel flow rate adjustments and speed of rotation, if seals are removed, or if parts not described in the operating and maintenance manual are removed and reassembled by unauthorized personnel.

In addition to all other machine specifications, ensure that the engine is in a near horizontal position when starting. If starting manually, ensure that the necessary operations can be performed without any risk of striking against walls or dangerous objects. Rope starting (except for recoil rope starting) is not permitted even in emergencies.

Check that the machine is stable so that there is no risk of it overturning.

Get to know the engine speed adjustment and machine stop operations.

Do not start the machine in closed or poorly ventilated environments. The internal combustion process generates carbon monoxide, an odorless and highly toxic gas, so spending too long a

time in an environment where the engine discharges its exhaust products freely can lead to loss of consciousness and even death.

The engine may not be used in environments containing flammable materials, explosive atmospheres or easily combustible powders, unless adequate and specific precautions have been taken and are clearly stated and certified for the machine.

To prevent the risk of fire, keep the machine at a distance of at least one meter from buildings or other machines.

Children and animals must be kept at a sufficient distance from the machine to prevent any danger resulting from its operation.

Fuel is flammable, so the tank must be filled only when the engine is turned off. Dry carefully any fuel that may have spilled, remove the fuel container and any cloths soaked in fuel or oil, check that any sound-absorbing panels made of porous material are not soaked with fuel or oil, and make sure that the ground on which the machine is located has not absorbed fuel or oil.

To start the engine, follow the specific instructions provided in the engine and / or machine operating manual. Do not use auxiliary starting devices not originally installed on the machine (e.g. Start pilot systems which utilize ether, etc.)

Before starting, remove any tools that have been used for carrying out maintenance work to the engine and / or the machine and check that any guards removed have been replaced. In cold climates, it is possible to mix kerosene with the diesel fuel to make the engine easier to start. The liquids must be mixed in the tank by pouring in first the kerosene and then the diesel fuel. Consult your servicing dealer for correct mixture proportions. Petrol may not be used because of the risk of it forming flammable vapors.

During operation the surface of the engine reaches temperatures that may be dangerous. Avoid in particular all contact with the exhaust system.

Before carrying out any work on the engine, turn it off and allow it to cool down. Do not perform any operation while the engine is running.

The liquid cooling circuit is under pressure. Do not carry out any checks before the engine has cooled down, and even then, open the radiator cap or the expansion tank cautiously. Wear protective clothing and glasses. If there is an electric fan, do not approach the engine while it is still hot as the fan may come on even when the engine is not running. Clean the cooling system with the engine turned off.

While cleaning the oil bath air filter, check that the oil is disposed of in such a way as not to harm the environment. Any filtering sponges in the oil bath air filter should not be soaked with oil. The cyclone pre-filter cup must not be filled with oil.

Since the oil must be emptied out while the engine is still hot (approximately 80°C), particular care should be taken in order to avoid burns. In any case make sure that oil does not come into contact with your skin because of the health hazards involved.

Check that the discharged oil, the oil filter and the oil contained in the oil filter are disposed of in such a way as not to harm the environment.

Close the fuel tank filler cap carefully after each filling operation. Do not fill the tank right up to the top, but leave sufficient space to allow for any expansion of the fuel.

Fuel vapors are highly toxic, so fill up only in the open air or in well ventilated environments.

Do not smoke or use naked flames while filling.

Take care when removing the oil filter as it may be hot.

The operations of checking, filling up and replacing the cooling liquid must be carried out with the engine turned off and cold. Take particular care if liquids containing nitrites are mixed with others not containing these compounds as this may give rise to the formation of nitrosamines which are a health hazard. The cooling liquid is polluting, so dispose of it in a manner that does not damage the environment.

During operations which involve access to moving parts of the engine and / or removal of the rotary guards, disconnect and insulate the positive cable of the battery so as to prevent accidental short circuits and activation of the starter motor.

Check belt tension only when the engine is turned off.

In order to move the engine use exclusively the eyebolts fitted for this purpose by Lombardini. These lifting points are however not suitable for the entire machine, so in this case use the eyebolts fitted by the manufacturer.

SAFETY INSTRUCTIONS FOR INSPECTION, MAINTENANCE, AND INSTALLATION WORK

Work may only be carried out on a pump unit that is shutdown. The pump unit may not be under pressure, and both the pump unit, and the diesel engine must be completely cooled down. The procedures for shutting down the pump unit are described in the Operating Instructions and must be observed at all times.

Pumps used to process hazardous substances must first be cleaned and/or decontaminated. As soon as the work is complete, all safety provisions and guards must be re-installed prior to continued pump operation.

When shutting down a pump unit for maintenance, the ground wire on the diesel engine must be disconnected, prior to performing any work on the pump unit.

UNAUTHORIZED MODIFICATION

Modifications and/or changes to the pump unit are only permitted with Thompson Pump Mfg. approval. The use of original spare parts and accessories will contribute to safety. In the case of other parts being used, Thompson Pump Mfg. shall be discharged from any form of responsibility for the consequences ensuing therefrom.

CENTRIFUGAL PUMP

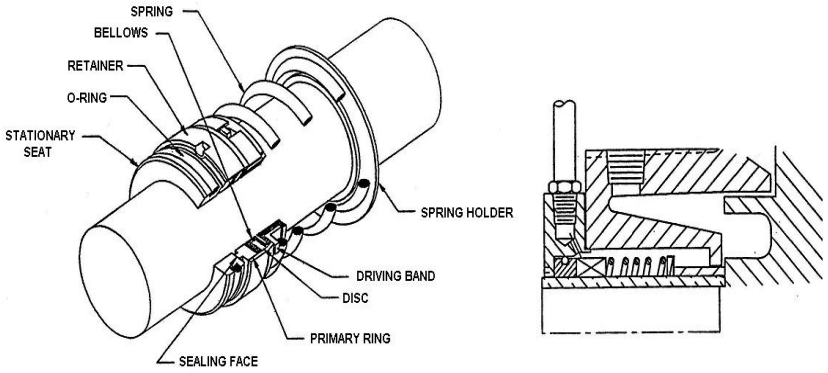
IMPELLER

Non-Clogging, with tangential volute. A 3 inch, 2 vane impeller, with a single wall volute. Capable of pumping up to 430 gallons of water, per minute, depending on suction hose size, and suction lift height.

MECHANICAL SEAL

The seal is composed of tungsten carbide seats, nitrile rubber elastomers, grease lubrication, and a back up lip seal.

The carbide seats have a low resistance to dry running and if the pump takes a long time to prime, this could damage the seal. Grease surrounds the seal housing to provide continuous lubrication, thus extend the life of the seal.



The seal housing is lubricated with grease.

CHECK VALVE

A suction flapper style check valve is provided on the suction side of the pump.

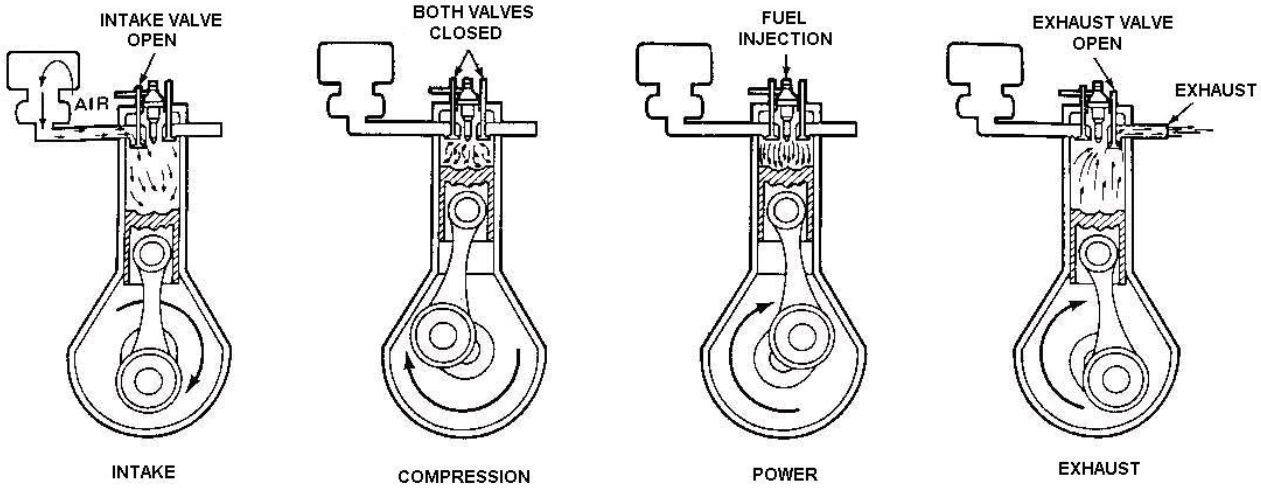
CENTRIFUGAL PUMP

The centrifugal pump is basically a rotating shovel for liquid. Each rotation it expels a portion of the liquid. The volume of the portion of liquid represents how many gallons per minute the pump delivers.

The liquid is thrown off the vane tips. At the center of the shaft there is no relative motion but the liquid there moves out to replace the liquid thrown off the tip. This creates a low pressure area at the shaft center, which is also the liquid inlet (pump suction). External pressure on the liquid supply, which is usually atmospheric pressure, forces more liquid into the pump suction.

The amount of velocity of the liquid as it leaves the pump determines how much head (or pressure) the pump will develop. This is determined by the diameter of the vane and how many revolutions per minute it makes (shaft speed).

DIESEL ENGINE



In the Diesel, the fuel is not mixed with the air entering the cylinder during the intake stroke. Air alone is compressed during the compression stroke. The Diesel fuel oil is injected or sprayed into the cylinder at the end of the compression stroke. In Diesel engines, compression ratios are as high as (22.5 to 1) and provide pressures of (500psi) at the end of the compression stroke. Through the compression process, the air can be heated up (1000 degrees F). This temperature is high enough to spontaneously ignite the fuel as it is injected into the cylinder. The high pressure of the explosion forces the piston down on the power stroke, then, as the piston moves upward, the exhaust stroke, the exhaust valve opens, clearing the gases out of the cylinder, making the cylinder ready to repeat the process.

BEFORE OPERATION

IS YOUR PUMP READY?

For your safety, and to maximize the service life of your equipment, it is very important to take a few moments before you operate the engine and/or the pump to check its condition. Be sure to take care of any problem you find, or have your servicing dealer correct it, before you operate the engine.

WARNING: *Improperly maintaining this pump, or failing to correct a problem before operation, could cause a malfunction in which you could be seriously injured. Always perform a pre-operation inspection before each operation, and correct any problems.*

Before beginning your pre-operation checks, be sure the pump is level and the engine switch is in the OFF position.

CHECK THE GENERAL CONDITION OF THE PUMP

Look around and underneath the engine for signs of oil or diesel fuel leaks.

Remove any excessive dirt or debris, especially around the muffler and recoil starter.

Look for signs of damage.

Check that all shields and covers are in place, and all nuts, bolts, and screws are tightened.

CHECK THE ENGINE

Check the engine oil level. Running the engine with a low oil level can cause damage.

Check the air filter. A dirty air filter will restrict air flow to the engine, reducing engine performance.

Check the fuel level. Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.

CHECK THE PUMP SUCTION AND DISCHARGE HOSES

Check the general condition of the hoses prior to connecting them to the pump.

The suction hose must be made of a reinforced material to prevent collapse during operation.

The gasket on the suction hose must be in good condition, and properly installed.

All hose connectors and clamps must be in good condition, and properly installed.

If installed, ensure the strainer is clean, and in good condition.

Ensure that the discharge hose is secured, to prevent movement, and possible injury.

This pump is designed to pump liquids, including muddy water, water containing solids, and non-potable liquids. It is not designed to pump potable (drinking) water, and should never be used for this application.

Due to the pump operation, the pump assembly and/or hoses may move up and down, or side to side during operation. This may cause the pump to move around while the pump is operating. Depending on factors such as hose length, and the surface that the pump is installed on, this movement may result in injury, and consideration should be given to anchor the pump prior to operation. Unless the pump is monitored continuously, it is advisable to anchor the pump and hoses, to ensure no unexpected movement.

This pump is designed to pump solids, up to 1.0 inch. While pumping the liquids with the solids entrained, it is possible that the solid material will get lodged in the clapet, preventing the clapet from closing completely. Maximum pump performance can be achieved with the discharge hose angled slightly upwards during pump operation.

If the discharge hose will be running across a road, or in a traffic area, provide a means of protecting the hose, such as 4” x 4” boards running parallel to the hose, or a traffic control ramp, specifically designed for this application, to prevent collapse of the hose, and subsequent pump damage.

If this pump is used in an area where freezing may result, ensure that the pump is completely drained, prior to being left idle, to prevent pump casing damage.

SAFE OPERATING PRECAUTIONS

Before operating the engine for the first time, please review the SAFETY INFORMATION and the chapter titled BEFORE OPERATION.

WARNING: Carbon monoxide gas is toxic. Breathing it can cause unconsciousness and even kill you. Avoid any areas or actions that expose you to carbon monoxide.

SUCTION HOSE CONNECTION

The hose must be the same size, or larger, than the suction port connection. A larger suction hose will improve pump efficiency (i.e., using a 3" suction hose on a 2" pump). To prevent collapse of the hose, use a hose that is reinforced with a non-collapsible wall, such as braided wire construction. Keep the pump as close to the liquid you are pumping. Avoid kinks, or tight bends in the hose.

DISCHARGE HOSE CONNECTION

The discharge hose must be the same size, or larger than the discharge port connection. A hose that is too small will result in pump casing damage. Use of a larger hose on the discharge connection, will improve pump output by lowering the fluid friction caused by the hose.

After checking the gasket, connect the hose to the discharge, and tighten it securely.

STARTING THE PUMP

Do not actuate the starter for more than 20 seconds at a time. If the engine does not start, wait 1 minute before repeating the attempt. If the engine does not start after two attempts, trace the cause prior to proceeding. Consult "Diesel Engine Trouble Shooting Guide".

Switch

1st position – Warning light
2nd position – Starting
Key always in on 1st position when engine is running

1. Turn the key switch to position 1. Verify all warning lights are lit.

2. Turn key switch to position 2. The engine should start. If the engine does not start within 20 seconds, return the key switch to the 0 position (OFF), and wait at least 1 minute before attempting again.

3. When engine starts, key switch automatically returns to position 1.

NOTE: Make sure that all warning lights are off when the engine is running. For engines with starting panel equipped with engine protection, make sure the "OK" light only, keeps ON.

4. Allow the engine to remain at idle speed (minimum) per the chart below:

Temperature	Time
≤ - 20°C	5 minutes
- 20°C / -10°C	2 minutes
-10°C / -5°C	1 minute
⊕ 5°C	20 seconds

CAUTION: During 1st 50 hours, do not exceed 70% of maximum rated power.

WARMING UP

After the engine has started, run for 1 minute at a low engine speed. Full load running while the engine is cold can cause the engine to emit black exhaust smoke and shorten engine life. While warming up, check the engine for any abnormal noise or vibration.

RESTARTING AFTER STARTING FAILURE

When attempting to restart the engine after starting failure, be sure that the engine is at a complete stop before turning the key.

CAUTION: Do not turn the key to the 2nd position when the engine is not completely stopped or during operation. Otherwise, the starter motor pinion or ring gear will be damaged.

Wait at least 1 minute before the second attempt to allow for battery voltage recovery.

AFTER THE ENGINE HAS STARTED

After the engine has started, warm up the engine and check the following points. If an abnormality is found, stop the engine and correct the abnormality. If in doubt, contact your servicing dealer.

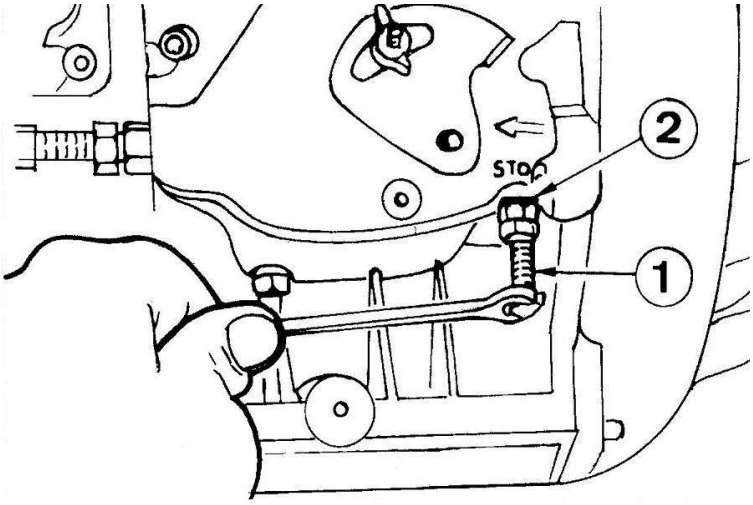
Alarm lamps

Fuel leaks and oil leaks from engine
Color of exhaust gas
Vibration or noise

SETTING IDLE (LOW SPEED) STOP

After filling the engine with oil and fuel, start the engine, and allow it to warm up for at least 5 minutes.

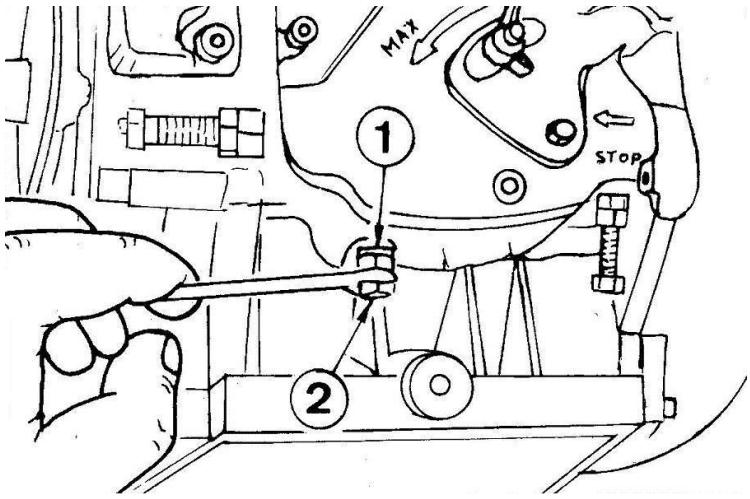
Adjust the idling speed at 1000 to 1250 RPM, by turning the setscrew. At the desired speed, tighten the locknut securely. (Washer "2" assures sealing and prevents possible oil leaks).



SETTING HIGH SPEED STOP

Set the idle speed first, and then set the high speed stop.

Turn screw "2" and set full speed, no load conditions at 3,800 RPM. When set, tighten locknut securely. (Washer "1" assures sealing and prevents possible oil leaks).



ADJUSTING THE ENGINE SPEED

This engine speed is controlled by the governor lever on the side of the engine. A stud with a wing nut is used to lock the governor lever in a constant speed position, preventing movement due to pump vibration.

IMPORTANT CHECKS DURING OPERATION

Exhaust Gas Color – Avoid engine operation if black smoke continues to come out. Black smoke is generated when the engine is overloaded. This shortens the engine life.

Abnormal Noise or Vibration – Depending on the machine unit structure, resonance may arise at a certain engine speed, resulting in sudden violent vibration. Avoid engine operation near that speed. If this occurs, contact your servicing dealer.

Alarm Lamps – If an alarm lamp comes on, decrease the engine speed to reduce the load on the engine. After 5 minutes, stop the engine, check the cause and take the necessary action.

Oil or Fuel Leakage, or Loose Bolts – Occasionally check the engine and its peripheral parts for any symptoms of leakage or loosened bolts.

Hoses – Always keep an eye on the level of the fluid being pumped, to ensure that the suction hose does not become uncovered, allowing the pump to run dry for an extended period of time. Care should be taken to ensure that the discharge hose does not become crimped, or allowed to move excessively while the pump is running.

Low Fuel Level in Tank – Always replenish fuel before the level drops too low during operation. If level gets too low, air will be drawn into the fuel injection pump, and the pump will not be able to function properly.

NOTES: Allowable inclined engine operation: 35 degree's maximum. Excess inclined engine operation may result in white exhaust smoke, sudden engine over speed or engine internal damage (getting engine oil into the intake port. Operate the engine on a surface that is as level as possible.

Avoid low load running as much as possible. Operation at low speeds for long periods of time may result in carbon mixing in with the unburned fuel, depositing the piston head, injection nozzle and exhaust pipe to cause engine trouble.

Do not turn the key to the 2nd position while the engine running. Otherwise, the starter motor pinion or ring gear will be damaged.

- Pay sufficient attention not to bring part of your hand and body or clothes in contact with the silencer, exhaust pipe, and engine body during operation or shortly after stopping the engine. The whole engine is hot and may cause scalding / serious burns.

The engine can be stopped 2 ways:

1. Turn the key switch to the "0" position. Remove the key from the switch and place it in a safe place.

2. Push lever on governor all the way down to the stop position.

Before stopping engine, reduce speed (if practicable) to minimum. Remain at minimum speed for 2 to 5 minutes, to allow for engine Cooldown.

NOTES: If the engine is stopped immediately without the cool-down period, the temperature of engine parts will rise suddenly, and could cause engine failure. Always cool-down the engine at low speed for a few minutes when securing.

When leaving the engine (pump unit) in open air after operating, place on a level surface, keep away from flammable material such as straws, withered grass as this could result in ignition. After cooling the engine (pump unit) thoroughly, cover it to protect the air cleaner, silencer and electrical parts (alternator, starter motor, switches, etc.) from water and dust.

Ensure the cap for the fuel fill connection is installed, and tight to prevent any water or dust from entering the fuel tank.

THIS SECTION EXPLAINS WHEN AND HOW TO PERFORM ROUTINE INSPECTION, SERVICE, AND ADJUSTMENTS FOR THE DO-IT-YOURSELF MAINTENANCE. MORE DIFFICULT MAINTENANCE TASKS SHOULD BE PERFORMED BY YOUR AUTHORIZED SERVICING CENTER. THEY ARE BEST EQUIPPED AND STAFFED TO PROVIDE THE LEVEL OF SERVICE AND SAFETY YOU AND YOUR PUMP DESERVES.

MAINTENANCE

THE IMPORTANCE OF MAINTENANCE

Good maintenance practice is essential for safe, economical and trouble-free operation. It will also help reduce pollution.

To help you properly care for your pump, the following pages include routine inspection procedures, and simple maintenance procedures, using basic hand tools. Other procedures are found in your engine manufacturer's service manual. Difficult or technically intensive tasks are best handled by your servicing dealer, or other qualified mechanic.

The preventive maintenance schedule applies to normal operating conditions. If you operate your pump under severe conditions, such as sustained high-load or high-temperature operation, or use in unusually dusty conditions, consult your servicing dealer for recommendations applicable to your use.

To ensure the best quality and reliability, use only genuine dealer parts for repair or replacement. Use of other manufacturer's parts may void your pump warranty.

MAINTENANCE SAFETY

Some of the most important safety precautions are as follows: However, we cannot warn you of every conceivable hazard that can arise in performing maintenance. Only you can decide whether or not you should perform a given task.

SAFETY PRECAUTIONS

- ☑ Make sure the engine is off before you begin any maintenance or repairs. This will eliminate several potential hazards:

- ☑ Carbon monoxide poisoning from engine exhaust.
  - Be sure there is adequate ventilation whenever you operate the engine.

- ☑ Burns from hot parts.
  - Let the engine and exhaust system cool before touching.

- ☑ Injury from moving parts.

- Do not run the pump unless instructed to do so.

☑ Read the instructions before you begin, and make sure you have the tools and skills required.

☑ To reduce the possibility of fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep cigarettes, sparks and flames away from all fuel related parts.

Remember that your servicing dealer knows your engine best and is fully equipped to maintain and repair it.

To ensure the best quality and reliability, use only new, manufacturer's genuine parts or their equivalents for repair and replacement.

KEEP GOOD RECORDS OF OPERATION

Keep a record of daily operation and the results of any maintenance performed.

DIESEL ENGINE PREVENTIVE MAINTENANCE

Component		Every 8 Hours	Every 150 Hours	Every 1000 Hours
Crankcase Oil Level	Inspect	🛠		
Nuts and Bolts for Torque	Inspect		🛠	
Gauges and Safety Shutdowns	Inspect	🛠		
Air Cleaner Element	Clean	◆		
	Replace		🛠	
Oil Cooling Fins	Clean		▲	
Fuel Tank	Clean			🛠
Injectors	Clean			🛠
Crankcase Oil	Check	🛠		
	Replace		🛠	
Oil Filter	Replace		🛠	
Fuel Filter	Replace		🛠	

◆ UNDER VERY DUSTY CONDITIONS, CLEAN FREQUENTLY

▲ UNDER EXTREMELY DUSTY CONDITIONS, CLEAN EVERY 8 HOURS

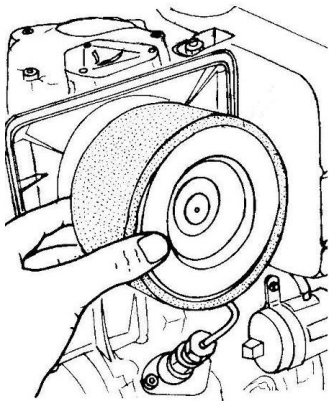
GOOD MAINTENANCE PRACTICES DICTATES CHECKING FOR COOLANT, FUEL AND OIL LEAKS AT EACH SERVICING INTERVAL. CHECK TIGHT ANY SUSPECT NUT, BOLT, OR SCREW.

EACH USE, AND DAILY INSPECTION

AIR CLEANER ELEMENT

In extremely dusty conditions, the air filter may require more frequent cleaning.

1. Remove the cover. Remove the air filter.
2. Thoroughly clean the air filter in a soapy water solution. Be careful not to cause any rips or tears in the filter element. If the air filter is damaged, replace it with a new one.
3. Thoroughly rinse and dry the air filter, replace it back into the filter housing.
4. Replace the cover.



CHECK ENGINE OIL LEVEL

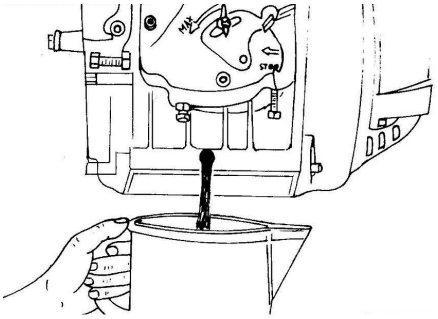
1. Remove the dipstick, clean, and replace the dipstick fully.
2. Remove the dipstick. Verify that the oil level is between the min and max, as marked on the dipstick.
3. If the level is below min, fill the sump using the oil fill connection on the rocker arm cover, or if this is not available, use the hole on the drain side, or the air filter side.
4. Re-check oil level after filling. DO NOT OVERFILL.
5. Ensure the dipstick is firmly seated, to prevent debris from entering the sump.

INSPECTION AFTER INITIAL 50 HOURS OPERATION

CHANGE ENGINE OIL AND OIL FILTER

- Use caution while the engine oil is still hot, being careful not to splash engine oil on your skin, which may cause burns.
- Change the dirty oil while the engine is warm. This allows the oil to drain quickly and completely.
- The initial wear of internal parts of the engine, results in the oil getting dirty rapidly.

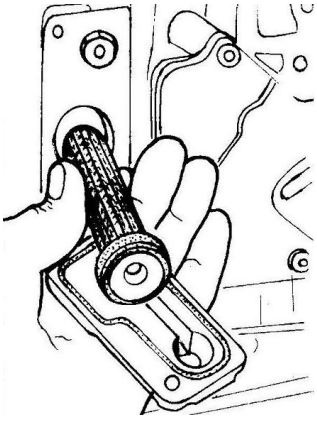
1. Place a suitable container, with at least 1 gallon capacity, below the engine to catch the used oil, and then remove the dipstick and the oil filler cap from the engine. (Removing the oil filler cap allows the engine oil to drain quickly).



2. Open the oil pan drain plug, and allow all of the oil to drain completely. Install the drain plug, tightened securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash; pour it on the ground, or down a drain as oil can be harmful to the environment.

3. Turn the screw on the oil filter counter-clockwise using an allen wrench (customer procured) to remove it.



4. Clean the engine oil filter mounting face.

5. Moisten the new engine oil filter gasket with the engine oil and install the new engine oil filter. Cover screw tightening torque: 15 to 17 ft-lbf.

6. Fill with engine oil up to the upper limit on the dipstick. To check the oil level, insert the dipstick in fully. When checking the engine oil level with the dipstick, wait for about 3 minutes and then check the level as it takes a little while for the engine oil supplied from the filler port to fill the oil pan. (NOTE: sump capacity is 1.3 quarts)

7. Manually tighten the filler cap. Excess tightening may cause to damage the filler cap.

   WARNING: Do not overfill the oil pan with engine oil. Be sure to keep the specified level between upper and lower limit on the dipstick.

8. Warm up the engine by running for approximately 5 minutes, while observing for any oil leakage.

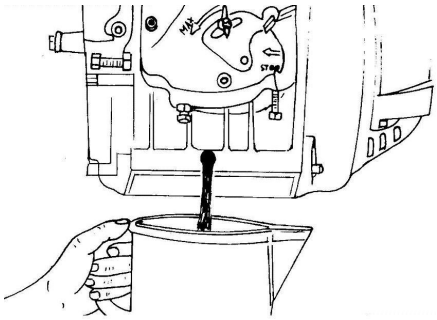
9. Stop the engine after warming up and leave it stopped for about 10 minutes. Recheck the engine oil level with dipstick, replenish if necessary. If any oil is spilled, wipe it away with a clean cloth.

INSPECTION EVERY 150 HOURS OPERATION

CHANGE THE ENGINE OIL AND OIL FILTER

- Use caution while the engine oil is still hot, being careful not to splash engine oil on your skin, which may cause burns.
- Change the dirty oil while the engine is warm. This allows the oil to drain quickly and completely.
- The initial wear of internal parts of the engine, results in the oil getting dirty rapidly.

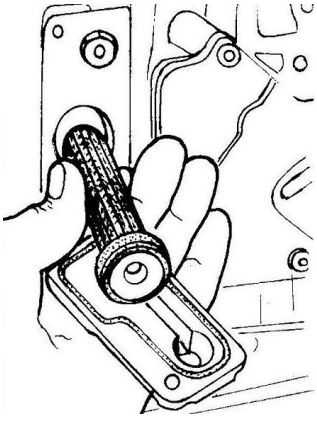
1. Place a suitable container, with at least 1 gallon capacity, below the engine to catch the used oil, and then remove the dipstick and the oil filler cap from the engine. (Removing the oil filler cap allows the engine oil to drain quickly).



2. Open the oil pan drain plug, and allow all of the oil to drain completely. Install the drain plug, tightened securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash; pour it on the ground, or down a drain as oil can be harmful to the environment.

3. Turn the screw on the oil filter cover counter-clockwise using an allen wrench (customer procured) to remove it.



4. Clean the engine oil filter mounting face.
5. Moisten the new engine oil filter gasket with the engine oil and install the new engine oil filter. Cover screw tightening torque: 15 to 17 ft-lbf.
6. Fill with engine oil up to the upper limit on the dipstick. To check the oil level, insert the dipstick in fully. When checking the engine oil level with the dipstick, wait for about 3 minutes and then check the level as it takes a little while for the engine oil supplied from the filler port to fill the oil pan. (NOTE: sump capacity is 1.3 quarts)

8. Manually tighten the filler cap. Excess tightening may cause to damage the filler cap.

   WARNING: Do not overfill the oil pan with engine oil. Be sure to keep the specified level between upper and lower limit on the dipstick.

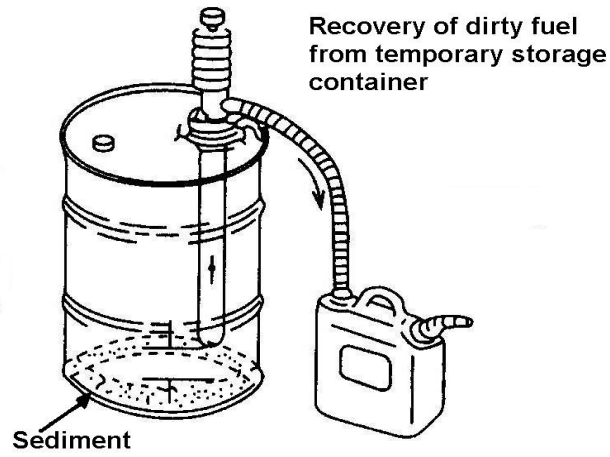
9. Warm up the engine by running for approximately 5 minutes, while observing for any oil leakage.

10. Stop the engine after warming up and leave it stopped for about 10 minutes. Recheck the engine oil level with dipstick, replenish if necessary. If any oil is spilled, wipe it away with a clean cloth.

DRAINING OF THE FUEL TANK

1. Place a suitable container, with at least 5 gallon capacity, below the tank to catch the fuel.

   NOTE: If necessary, transfer the contents of the 5 gallon drum to a larger capacity drum, and then continue draining. The larger capacity drum may be allowed to settle out, and recover some of the fuel for future use.



2. Loosen the drain plug from the fuel tank to drain (water, dirt, etc.) from the fuel tank bottom.

   Please dispose of dirty fuel in a manner that is compatible with the environment. We suggest you take the dirty fuel in a sealed container to your local recycling center. Do not throw it in the trash; pour it on the ground, or down a drain as the fuel can be harmful to the environment.

3. Drain until fuel with no water or sediment comes out. Then tighten the drain plug firmly. (It is recommended to use Teflon tape on the threads of the drain plug, to ensure zero leakage around the threads)

REPLACE THE FUEL FILTER

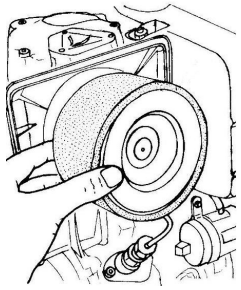
1. Place a container under the fuel filter prior to unthreading. This will prevent unnecessary fuel spillage.

2. Turn the engine fuel filter counter-clockwise using a filter wrench (customer procured) to remove it.

3. Clean the engine fuel filter mounting face.

4. Moisten the new engine fuel filter gasket with diesel fuel and install the new engine fuel filter manually turning it clockwise until it comes into contact with the mounting surface, and tighten it further to ¾ of a turn with the filter wrench. Tightening torque: 15 to 17 ft-lbf.

REPLACING THE AIR CLEANER ELEMENT



1. Remove the cover. Remove the air filter.

2. Install a new air filter, back into the filter housing.

3. Replace the cover.

CHECK TORQUE OF ALL NUTS AND BOLTS

Check that all the nuts and bolts on the engine and the pump unit are torqued to the proper value, using the supplied torque reference chart.

CHECKING AND CLEANING COOLING FINS

- Whenever using compressed air for cleaning, wear protective equipment such as goggles to protect your eyes. Dust or flying debris can cause severe eye irritation.

- Dirt and debris adhering on the engine cooling fins reduce the cooling performance, causing overheating. Make it a rule to check the engine cooling fins daily and clean as needed.

  - Blow off dirt and dust from fins and periphery with compressed air, 28 psi (0.19MPa (2kgf/cm^2) or less so you do not damage the fins.

- If contaminated heavily, apply detergent, thoroughly clean and rinse with light water spray.

INSPECTION EVERY 1000 HOURS OF OPERATION

CHECKING AND ADJUSTING THE FUEL INJECTION VALVE

- This adjustment requires specialized knowledge and skill, consult your servicing dealer. This adjustment is needed to obtain the optimum injection pattern for full engine performance.

ADJUSTING INTAKE / EXHAUST VALVE CLEARANCE

- This adjustment requires specialized knowledge and skill, consult your servicing dealer. The adjustment is necessary to maintain the correct timing for the opening and closing of valves. Neglecting the adjustment will cause the engine to run noisily and result in poor engine performance and other damage.

LAPPING THE INTAKE AND EXHAUST VALVES

- This maintenance requires specialized knowledge and skill, consult your servicing dealer. The adjustment is necessary to maintain proper contact of the valves and seats.

CHECKING AND ADJUSTING THE FUEL INJECTION TIMING

- This maintenance requires specialized knowledge and skill, consult your servicing dealer.

TESTING THE VOLTAGE REGULATOR

1. Check that all connections correspond to the drawing.
2. Disconnect the positive (+) terminal from the battery.
3. Connect a DC voltmeter between the (+) and (-) terminals on the battery.
4. Connect an ammeter between the positive (+) pole on the battery, and the “B+” terminal on the voltage regulator.
5. Start and stop the engine until the battery voltage drops below 13 vdc.
6. When battery voltage reaches 14.5 volts, the ammeter current should suddenly drop down to almost zero.

7. Replace the regulator if the recharge current is zero with voltage less than 14.0 volts.

WARNING: When the engine is running, do not disconnect the battery cables, or switch the key to “OFF” position.

Keep the voltage regulator away from heat sources greater than 75°C.

Do not perform electric welds on the engine.

PUMP PREVENTIVE MAINTENANCE SCHEDULE

REGULAR SERVICE PERIOD Perform at every indicated month or operating hour interval whichever comes first. (1)		Each Use	Daily	Monthly	Every 6 Months or 2500Hrs.
Pump Volute	Flush	🛠			
Hoses and Strainer	Check	🛠			
Seal Housing	Grease	🛠		🛠(2)	
Oil Seal	Inspect	🛠	🛠		
Mechanical Seal	Inspect		🛠		🛠
Impeller and Wearing Ring	Inspect				🛠
All Critical Fasteners	Check Torque				🛠

(1) For commercial use, log hours of operation to determine proper maintenance intervals.

(2) For continuous operation, grease seal weekly

PUMP FLUSHING

Proper pump care requires that the pump volute chamber be flushed with fresh water, to ensure that no corrosive liquids or potentially damaging particles are left inside the pump during idle periods.

1. Remove all plugs from the pump casing.

2. Flush the pump from the discharge side, using a high velocity stream of fresh water. Continue flushing until clear water comes out of the suction side plug.

3. Reinstall the plugs using new O-Rings.

GREASE THE MECHANICAL SEAL

Once per week, during 24 hour per day operation, apply 2 strokes of grease to the fitting on the back of the pump casing.

REPLACING THE MECHANICAL SEAL

1. Disconnect the suction and discharge piping.

2. Remove the two bronze wrench nuts (14), and swing the tye rods (12) out of the way.

3. Remove the pump cover (28) from the pump casing (4). Remove and discard the pump cover O-Ring (27).

4. Remove the impeller locknut (11) and washer (10).

5. Using a gear puller, remove the impeller. If a gear puller is not available, use 3 wooden wedges, equally spaced around the impeller, and wedge the impeller off evenly. Extreme care using wedges is important to minimize the potential of bending the shaft, which could cause abnormal wear to the bearings and the mechanical seal.

NOTE: Using a metal tool for removing the impeller, instead of wooden wedges, can cause damage to the back blades of the impeller, and should be avoided.

6. Remove the mechanical seal assembly (7) from the shaft.

7. Remove the four screws (6) and washers (5) from the pump casing (4).

8. Remove the pump casing (4) from the engine.

9. Carefully remove the stationary portion of the mechanical seal (7) and the oil seal, and replace with a new seal.

10. Using serviceable thread sealant **(blue)**, assemble the pump casing (4) on to the engine using the four screws (6) and washers (5).

11. Lubricate the new mechanical seal (7) with a light film of clean oil, and assemble the seal on the shaft.

12. Place the spacer over the shaft, and insert the key (8) on the shaft.

13. Install the impeller (9) to the shaft, using the old locknut (11) and washer (10).

14. Measure the clearance from the impeller blade facing and the pump casing (4) O-Ring seating surface.

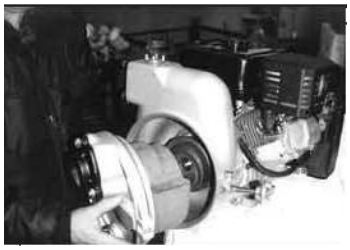
15. Measure the clearance from the top of the rubber wear plate (25) and the O-Ring seating surface of the pump cover (28).

16. If the clearance difference measured in step 14, minus the clearance measured in step 15, is greater than 0.5 mm, then shims must be added between the impeller and the mechanical seal. Remove the impeller and add or remove shims as necessary until the clearance is as close to 0.5 mm as possible.

17. Install the impeller (9) to the shaft using a new locknut (11) and washer (10) and thread sealant **(red)**. Torque the locknut to 20 ft-lbf.

18. Inspect the rubber wear plate surface for damage. If damage is found, the wear plate must be replaced, and the measurements in steps 14, 15, and 16 must be re-done.

19. Clean the O-Ring seating surface on the pump cover (28) and the pump casing (4). Install a new O-Ring (27).



20. Fit the pump cover (28) to the pump casing (4). Install the bronze wrench nuts on the tye rods, and tighten firmly.

REPLACING THE WEAR PLATE

1. Remove the suction line.

2. Remove the two bronze wrench nuts (14), and swing the tye rods (12) out of the way.

3. Remove the pump cover (28) from the pump casing (4). Remove and discard the pump cover O-Ring (27).

4. Remove the three screws (26) that hold the wear plate (25) to the pump cover (28). Remove the wear plate (25).

5. Remove and replace the volute O-Ring (23).

6. Using serviceable thread sealant **(blue)**, replace the wear plate (25) to the pump cover (28) using the three screws (26).

7. Clean the O-Ring seating surface on the pump cover (28) and the pump casing (4). Replace the pump cover O-Ring (27).

8. Install the pump cover (28) to the pump casing (4) using the two bronze wrench nuts (14), tightened firmly.

REPLACING THE SUCTION FLAPPER

1. Remove the suction line.

2. Remove the three nuts (18) from the suction port (30). Remove the suction port (30) and flapper (29).

3. Replace the flapper (29).

4. Install the suction port (30) to the pump cover (28) using serviceable thread sealant **(blue)**, and the three nuts (18).

PUMP TROUBLESHOOTING GUIDE		
Symptoms	**Causes**	**Corrections**
Pump fails to prime – low volume output	Air leaks on suction side of system. Suction lift too high. Obstruction in Suction or Discharge Broken belt on vacuum system Clogged vacuum system suction line Overheated liquid in pump casing Impeller worn or broken Impeller clogged with debris Wearing ring worn Suction strainer is clogged by debris Discharge head greater than rated capacity Discharge check valve clogged Engine running to slow	Tighten connections/seal leaks. Check and lower pump if possible (20' max). Clear obstruction/back flush. Replace with spare belt Clear suction line, check eductor clear Check proper discharge path Replace impeller Disassemble and clean impeller volute Replace wearing ring Clean strainer Evaluate discharge path, contact manufacturer Clear check valve, check operation See engine troubleshooting guide
Pump fails to provide proper pressure	Viscosity of the liquid is higher than expected Engine governor high setting incorrect Engine internal problem Mechanical problem with pump Foreign material inside casing Bearing failure	Contact servicing dealer Reset governor under no load conditions Consult engine troubleshooting guide Check for broken shaft, bad coupling, etc. Disassemble and clean impeller Replace bearings
Driver overloaded	Speed higher than planned Liquid specific gravity too high Liquid handled of greater viscosity than water Too large an impeller diameter Low voltage Stress in pipe connection to pump	Reduce speed Contact servicing dealer Contact servicing dealer Trim impeller Consult power company Support piping properly
Pump vibrates or is noisy	Pump capacity is too low Pump is not mounted correctly Piping not mounted / fixed Pump is cavitating Suction strainer clogged with debris Obstruction in suction or discharge Misalignment Excessive suction lift Clogged suction strainer Impeller clogged with debris Worn bearings Impeller screw loose or broken Cavitation (improper suction design) Wrong direction of rotation	Check vacuum gauge for proper suction Check mounting bolts tight Check for proper piping run Check "Pump does not Prime" section Clean strainer Clear obstruction/back flush Align all rotating parts Contact servicing dealer Clean strainer Disassemble and clean impeller volute Replace bearings Replace lockscrew Correct suction piping See start-up instructions
Premature bearing failure	Worn wearing ring Misalignment Suction or discharge pipe not properly supported	Replace ring Align all rotating parts Correct supports

	Bent shaft Water or contaminates entering bearings Lubrication to bearings not adequate Wrong type of lubrication	Replace shaft Protect pump from environment See lubrication instructions See lubrication instructions
Pump overheating	Clogged suction strainer Suction line clogged Worn wearing ring	Clean strainer Clear debris Replace ring
Premature coupling failure	Misalignment of coupling Bent shaft	Align coupling Replace shaft

COMMON DIESEL ENGINE PROBLEMS

Complaint ----------> Probable Cause	Will Not Start	Hard To Start	Starts And Stalls	Dies On Deceleration	Runs Rough	Lack Of Power	Black Smoke	White Smoke
Low Cranking Speed	X	X						
Incorrect Starting Procedure	X	X						
Some or All Glow Plugs Bad	X	X			X			X
No Fuel to Cylinders	X							
Plugged or Restricted Return	X	X	X		X	X		X
Insufficient Fuel Supply	X	X	X		X			X
No Voltage to Shutoff Solenoid	X							
Shutoff Solenoid Bad	X	X	X					
Poor Fuel Quality	X	X	X		X	X		
Some or All Injectors Bad	X	X			X		X	X
Incorrect Pump to Engine Timing	X	X				X		X
Low Compression	X	X						X
Bad Injection Pump	X	X	X		X			X
Idle Speed Too Low			X	X	X			
Fast Idle Solenoid Bad			X					
Air In Fuel			X		X			
Governor Binding				X				
Metering Valve Sticking In Injection Pump				X				
Fuel Leaks at Injection Lines					X			
Air Inlet Restricted						X	X	
Incorrect Engine Timing	X	X					X	X
Internal Engine Problems	X	X				X	X	

AIR IN THE SYSTEM

- Air can cause numerous problems with the diesel engine and is one of the hardest problems to solve. The best way to determine that air is the problem is to hook up a clear hose in the return system. If air is coming through the return system then it is probably getting into the system on the inlet side somewhere and causing problems with the fuel system.
- Air can enter the system two ways. The first is a bleed back where air is evident after the engine sets inoperative for a period of time and the fuel drains back to the tank and the system has to be reprimed. The engine may or may not start but if it does start it may only run a few seconds, die and refuse to start immediately. The lift pump is one of the most common causes of this situation; however any opening in the fuel system can allow this situation.
- Constant air out the return and constant rough running, missing and white smoke can also be an indication of air in the system. In this situation air is usually entering the system somewhere prior to the pump inlet. If a fuel leak is evident this should be checked and repaired first, however a fuel leak does not necessarily have to be evident where air is entering. Sometimes the fuel system can be pressured up by an external fuel pump. If a fuel leak then becomes evident this could be the source of the air leak. Visual inspection of rubber hoses, line fittings and steel lines where they have been rubbed should also be made to isolate the source of the air.

BLACK SMOKE

- Black smoke can be caused when there is an improper air to fuel ratio. The fuel does not burn completely and the partially burned particles are expelled in the exhaust. One of the most common causes of black smoke is an air inlet restriction. This can be anything from a plugged air cleaner, an intake hose collapsing or anything else causing an air flow problem even plugged exhaust.
- Injector malfunction is also a common cause for black smoke as is incorrect engine timing. Over fueling can also cause black smoke and is one of the reasons setting a fuel system above factory specifications is strongly discouraged. Internal injection pump problems can also result in black smoke.

WHITE SMOKE

- White smoke usually occurs when there is not enough temperature to burn the fuel. The unburned fuel particles are then exhausted usually by a rich fuel smell. In cold weather it is not uncommon to get white smoke until engine temperature builds up. One cause of white smoke on engine start up could be faulty glow plugs or glow plug system. Low engine cranking speed can also create an excessive amount of white smoke.
- If the problem persists after the engine is up to operating temperature several other things should be checked. A faulty injector can cause white smoke. Timing is often a factor when white smoke is excessive. Low engine compression can cause the problem and the injection pump can also have problems that result in white smoke. Air in the fuel system can also result in white smoke.

GLOW PLUG

- One of the main reasons an electric start engine can be hard to start is faulty glow plugs. Not all the glow plugs have to be bad before the engine gets hard to start. Glow plugs can be checked several ways. One of the easiest ways is with a continuity meter. If the meter does not read when connected the glow plug is bad. Weak glow plugs can also be detected by the actual meter reading, however each application has its own specification that must be known before the test can be accurate. If no reading is achieved the glow plug must be replaced.

INJECTOR PROBLEMS

- Several symptoms relate to possible injector problems. These symptoms include but are not limited to: oil dilution, engine running rough, a dead miss, smoke (white or black), a drop in fuel economy and starting problems.
- Injectors can suffer from a drop in opening pressure. This usually occurs after several thousand hours in use. A drop of 200- 300 psi is normal and usually does not have a noticeable affect on the performance of the engine. If a pressure drop is more than 300 psi the injector should be reset to manufacturer's spec. in order to assure peak engine performance.
- A second problem injectors develop is poor fuel atomization. The main purpose of a nozzle holder assembly is to break the diesel fuel into small enough particles that it will burn properly. An injection nozzle is lubricated by the diesel fuel and any lubrication problems such as water or poor lubricating fuel quality can cause the nozzle to stick. This will hamper its ability to atomize the fuel properly. Another problem causing poor atomization is an improper valve seat. Sometimes due to contamination or wear the valve seat will become damaged. This also stops the injector from atomizing properly. In some cases a diesel injector cleaner in the fuel will help in these situations. In more severe cases the nozzle will need to be removed from the assembly, cleaned and reset to the manufacturers spec. In most cases the nozzle tolerances are so close that once the nozzle is damaged it is not repairable and the nozzle must be replaced in the nozzle holder assembly. New nozzles must then be checked and set to manufacturer's specs on a pop tester.

ENGINE STALLS

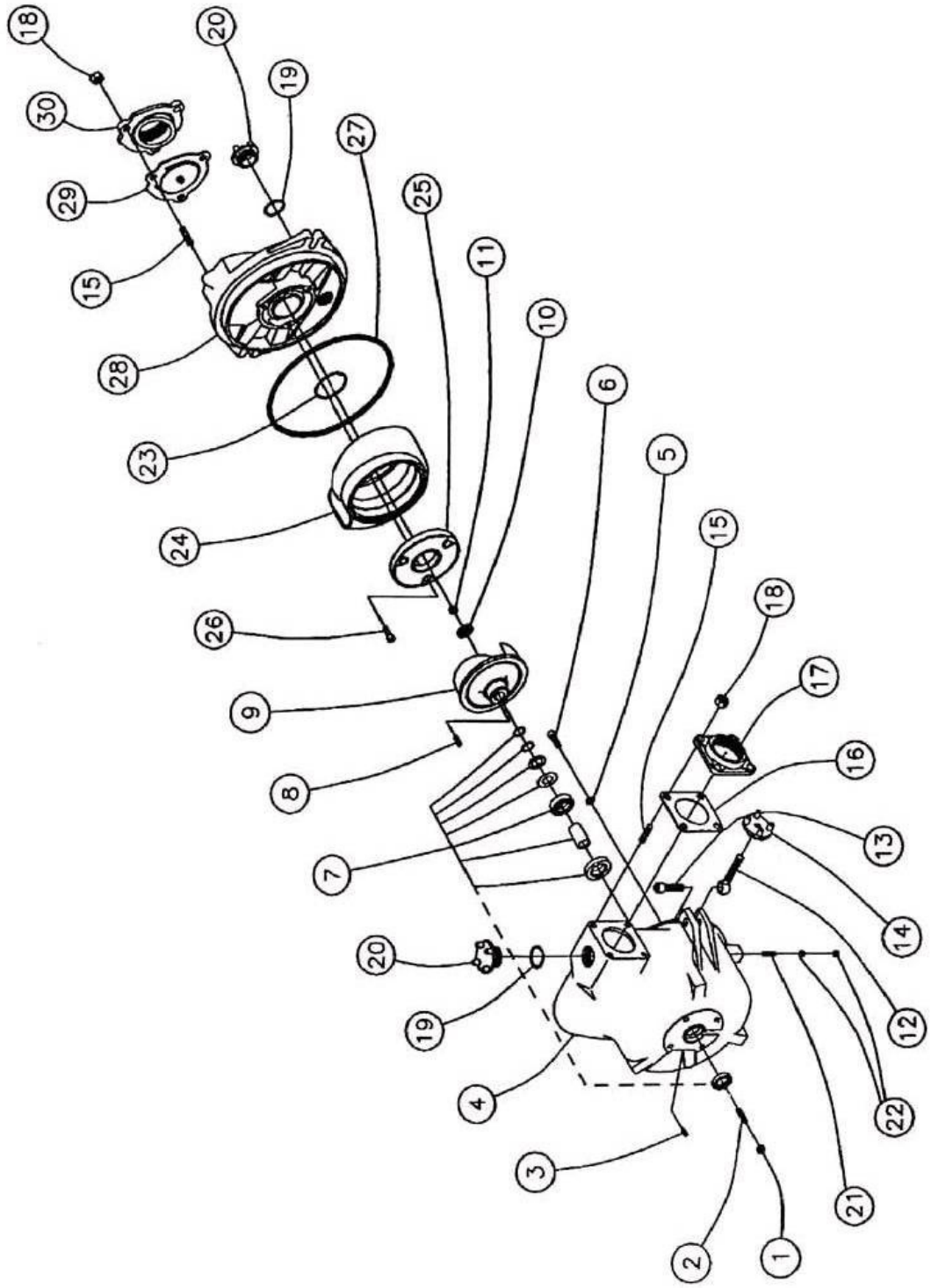
- When the engine stalls on deceleration it is usually an indication of lubrication problems in the pump. The first thing that should be checked is the idle RPM. If it is too low it could put the pump governor in a position where it cannot recover from the deceleration quick enough to keep the engine from stalling.
- If the idle is set to the proper RPM, a lubrication fuel additive might be used. In some cases a slight amount of water has passed through the system or an extra dry fuel has been used. This causes the metering valve or plungers & barrels to stick slightly. A lubrication additive in the fuel could solve this problem.

- In severe cases where an additive does not work, the pump needs to be torn down and cleaned. In extremely severe cases the metering valve or plungers & barrels may need to be replaced to solve the problem.

LOW POWER

- In most cases low power accompanies other systems such as smoke or a miss. In these cases the other symptoms should be researched first and when fixed the low power is usually fixed also.
- If low power is the only complaint then quantity of the fuel supply should be checked. On engines that have primary supply pumps the supply pump has been found to put out the proper pressure without pumping the proper quantity of fuel. A fuel restriction should also be researched, partially plugged fuel filters, blocked fuel lines and filters in the tank on some applications. If the tank is not vented properly it could build a vacuum which could act like a fuel restriction. Poor fuel quality can also result in low power.
- If the fuel system is getting air mixed with the fuel, low power is often the result. Air intake restrictions, exhaust restrictions, transmission problems and internal engine problems have also been known to cause power problems.

3T EXPLODED VIEW



3T Spare Parts Listing

REF	DESCRIPTION	PART NUMBER
001	Nut, SS 7/16”	Q14-3000-001
002	Impeller, Stud 7/16”	Q14-3000-002
003	Grease Fitting	Q14-TL003/0
004	Pump Casing	Q14-3000-004
005	Safety Washer	Q14-3000-005
006	Screw, SS, Pump Casing	Q14-3000-006
007	Mechanical Seal Assembly	Q14-TL007-31
008	Impeller Key	Q14-3000-008
009	Impeller	Q14-3000-009
010	Washer, Impeller	Q14-TL010/3
011	Locknut, Impeller	Q14-TL011/3
012	Tye Rod, SS	TL012/3
014	Nut, Bronze Knob	Q14-TL014/0
015	Stud	Q14-2000-015
016	Gasket, Discharge	Q14-3000-016
017	Discharge Port, NPT	Q14-3000-017
018	Nut	Q14-2000-018
019	O-Ring, Plug	Q14-TL019/0
020	Plug	Q14-TL020/0
021	Stud	Q14-3000-021
022	Nut	Q14-3000-022
023	O-Ring, Volute	Q14-3000-023
024	Volute	Q14-3000-024
025	Wear Plate w/Screw, SS	Q14-3000-025
026	Screw, SS for Wear Plate	Q14-TL026/0
027	O-Ring, Pump Cover	Q14-3000-027
028	Pump Cover	Q14-3000-028
029	Gasket, Flapper Assembly	Q14-3000-029
030	Suction Port, NPT	Q14-3000-030

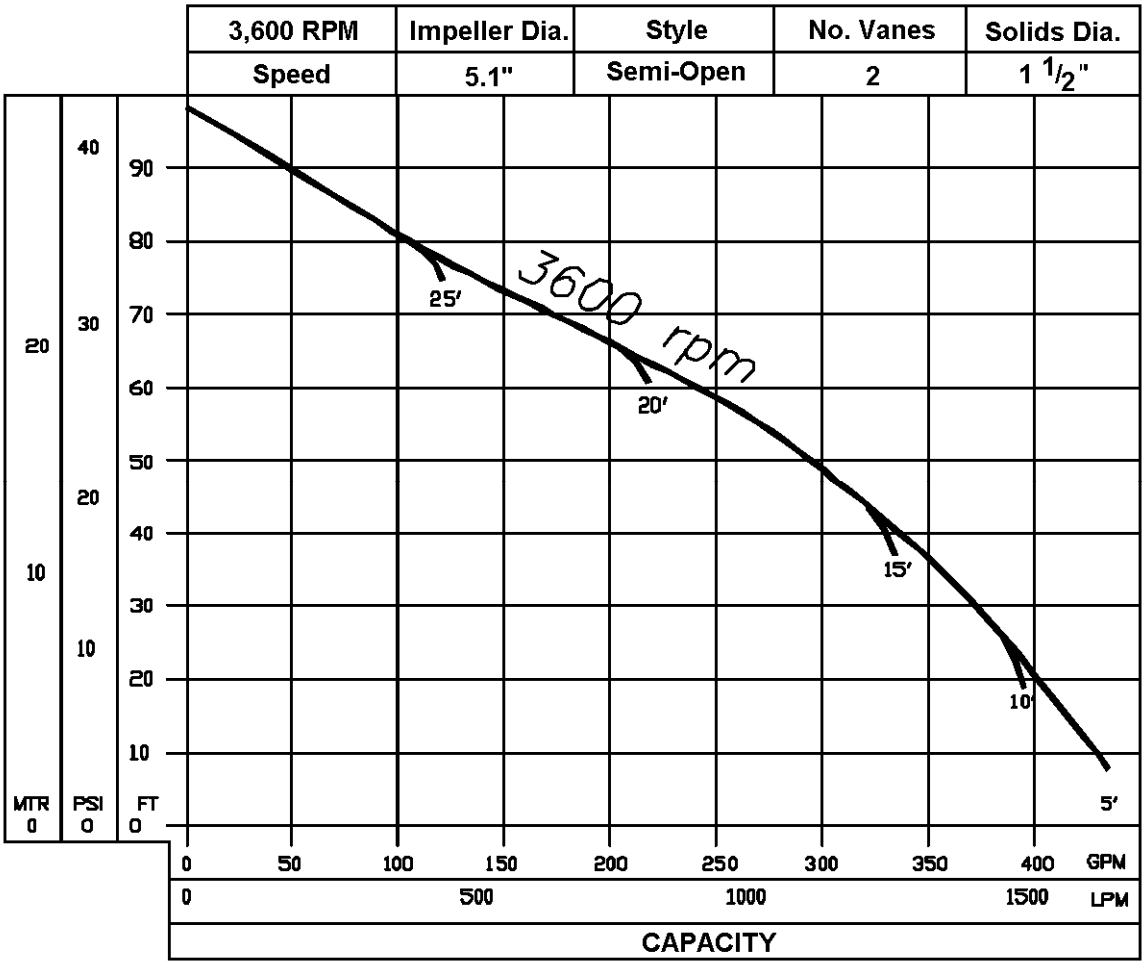
Pump performance Curve

Pump End: 3T
Used on Model: 3T

Pump Ratings: Maximum Impeller Speed: 3,600 rpm

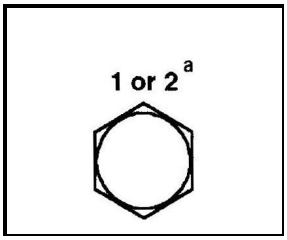
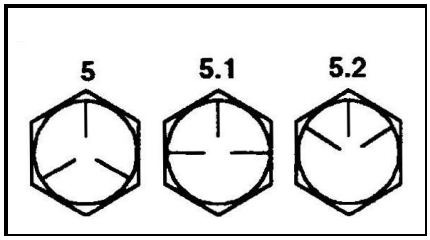
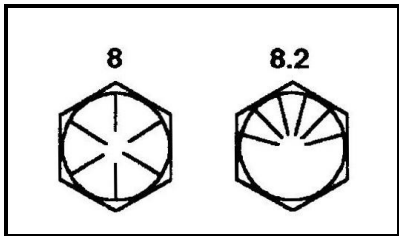
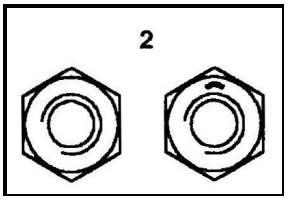
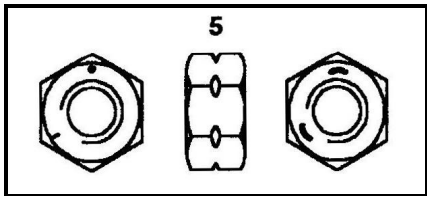
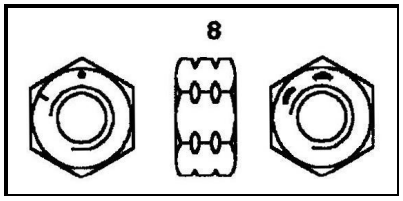
Test Conditions:

Fluid: Water S.G.: 1.0 Temperature: 68°F (20°C)
Altitude: Sea Level (1 Atmosphere) Viscosity: 31.5 SSU



NOTES: Refer to Thompson Unit Specification Sheets for maximum and minimum operating speeds for the particular driver.
Tests were conducted according to Hydraulic Institute ANSI/HI 1.6 – 1994 Standards.

TORQUE REFERENCE CHART

			
			
Bolt Size Inches	SAE 0 – 1 – 2	SAE Grade 5	SAE Grade 8
¼ - 20	6 ft-lbf	10 ft-lbf	14 ft-lbf
5/16 – 18	12 ft-lbf	19 ft-lbf	29 ft-lbf
3/8 – 16	20 ft-lbf	33 ft-lbf	47 ft-lbf
7/16 – 14	32 ft-lbf	54 ft-lbf	78 ft-lbf
½ - 13	47 ft-lbf	78 ft-lbf	119 ft-lbf
9/16 – 12	69 ft-lbf	114 ft-lbf	169 ft-lbf
5/8 – 11	96 ft-lbf	154 ft-lbf	230 ft-lbf
¾ - 10	155 ft-lbf	257 ft-lbf	380 ft-lbf
7/8 – 9	206 ft-lbf	382 ft-lbf	600 ft-lbf
1 – 8	310 ft-lbf	587 ft-lbf	700 ft-lbf

Size	Stainless Steel Lockscrew
.38 – 16 UNC	20 ft-lbf
.50 – 13 UNC	40 ft-lbf
.62 – 11 UNC	90 ft-lbf
.75 – 10 UNC	135 ft-lbf
1.00 – 8 UNC	265 ft-lbf

SAFETY ALERT SYMBOL

This Safety Alert Symbol means ATTENTION is involved.

The Safety Alert Symbol identifies important safety messages on machines, safety signs, in manuals, or elsewhere. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is SAFETY important to YOU?
3 BIG REASONS

- Accidents KILL or DISABLE
- Accidents COST
- Accidents CAN BE AVOIDED

NOTICE OF COPYRIGHT PROTECTION

AEM Safety Manuals are protected as a copy righted work with ownership duly registered with the Copyright Office, Washington, D.C. Any reproduction, translation, decompiling or other use of an AEM Safety Manual., or portion thereof, or the creation of derivative works based on an AEM Safety Manual, without the prior written approval of AEM is expressly prohibited. Copyright infringement can result in civil and criminal sanctions, damages and other penalties being imposed.

Copyright © 2004 – Association of Equipment Manufacturers

FOREWARD

This safety manual is intended to point out some of the basic situations which may be encountered during the normal operation and maintenance of your equipment, and to suggest possible ways of dealing with these conditions.

Additional precautions may be necessary, depending on application, pump type, configuration and attachments used, conditions at the work-site or in the maintenance area. The manufacturer has no direct control over pump application, operation, inspection, lubrication or maintenance. Therefore, it is your responsibility to use good, safe, practices in these areas.

The information provided in this manual supplements the specific information about your pump that is contained in the manufacturer's manual(s). Other information which may affect the safe operation of your pump may be contained on safety signs, decals, markings, insurance requirements, employer's safety programs, safety codes, local, state/provincial and federal laws, rules and regulations, contracts, agreements and warranties.

It is your responsibility to read and understand this safety manual and the manufacturer's manual(s) before operating your pump. This safety manual takes you step-by-step through your working day. If you do not understand any of this information, or if errors or contradictions seem to exist, consult with your supervisor before operating your pump.

IMPORTANT: If you do not have the manufacturer's manual(s) for your particular pump, get a replacement manual from your employer, equipment dealer, or manufacturer of your pump. Keep this safety manual and the manufacturer's manual(s) with your pump.

Unauthorized modifications of pumps create hazards. Pumps must not be modified or altered unless prior approval is obtained from the manufacturer.

DO NOT PUMP VOLATILE/FLAMMABLE OR CAUSTIC/CORROSIVE LIQUIDS. REFER TO THE OWNER'S MANUAL OR CONSULT WITH THE MANUFACTURER FOR THE PROPER PUMP MATERIALS IF YOU ARE TO PUMP HAZARDOUS CAUSTIC/CORROSIVE LIQUIDS.

FOLLOW A SAFETY PROGRAM

KNOW THE RULES

Each employer is concerned about safety. Safe operation and proper maintenance of your pump can prevent accidents. KNOW the rules – LIVE by them. (FIG 1.)

When starting work at a new site, check with the designated safety coordinator for specific safety instructions. DON'T LEARN SAFETY THE HARD WAY.

Know the meaning of all hand signals, signal flags, signs and markings. Know the traffic rules used at the work site. Know who the signal man is; watch and obey his signals.

Know where the fire extinguishers and first aid kits are kept and how to use them. Know where to get proper aid and assistance when needed.

Use common sense to avoid accidents. If an accident does occur, be prepared to react to it quickly and effectively. NEVER PANIC.

Remember that **YOU are the key to safety**. Good safety practices not only protect you but also protect the people around you. Study this manual and the manufacturer's manual(s) for your specific pump. Make them a working part of your safety program. Keep in mind that this safety manual is writt for only this type of equipmen Practice all other usual and customary safe working preca and above all (FIG 1.).

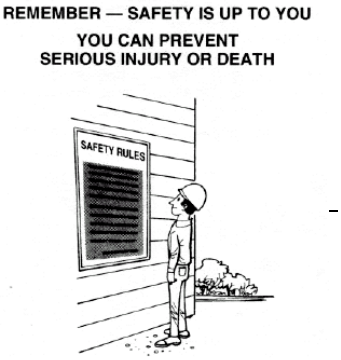


FIG. 1

FOLLOW A SAFETY PROGR

KNOW WHAT IT IS?

Consult your supervisor for sp Instructions and personal safety equipment required.

For instance, you may need:

- Hard Hat
- Safety Shoes
- Eye Protection
- Respirators
- Heavy Gloves
- Reflector Vests
- Hearing Protection
- Face Protection
- Back Supports
- Other job related specific items

Do not wear loose clothing or any accessory – flopping cuffs, untied show-laces, dangling neckties and scarves, rings, wrist watches, or other jewelry – that can catch on protruding or moving parts or controls. Long hair should be securely bound to prevent entanglement with moving parts. (FIG 3)

FIG. 2

FIG. 3

FIG. 4

BE ALERT!

Know where to get assistance. Know how to use a first aid kit and fire extinguisher or fire suppression system. (FIG 4)

BE AWARE!

Take advantage of training programs offered.

Safety programs should require that one person at each jobsite be assigned the overall responsibility and authority for safety. Know who the person it, and COMMUNICATE with the.

Know what the jobsite rules are, and FOLLOW THE RULES. Be safety conscious, responsible and reliable. Think about safety BEFORE something happens.

BE CAREFUL!

Human error is caused by many factors: carelessness, fatigue, overload, preoccupation, incompatibility between operator and the equipment, drugs, and alcohol to name a few. Damage to the equipment can be fixed in a short period of time, but injury, or death has a lasting effect.

For your safety and safety of others, encourage your fellow workers to act within safety rules.

PERFORM MAINTENANCE SAFELY

CLOTHING AND PERSONAL PROTECTIVE ITEMS

ALWAYS wear appropriate safety glasses, goggles, or face shield when working. (FIG 2) Proper eye protection can keep flying particles from grinding, drilling or hammering operations, or fluids such as fuel, solvents, lubricants and brake fluids from damaging your eyes. Normal glasses do NOT provide adequate protection.

ALWAYS wear a hard hat and safety shoes. (FIG 2) ALWAYS wear hearing protectors when exposed to high noise levels for extended periods. ALWAYS wear a respirator when painting or exposed to dusty conditions. ALWAYS keep your pockets free of loose objects, which can fall out and drop into machinery. (FIG 5) Heavy gloves should be worn

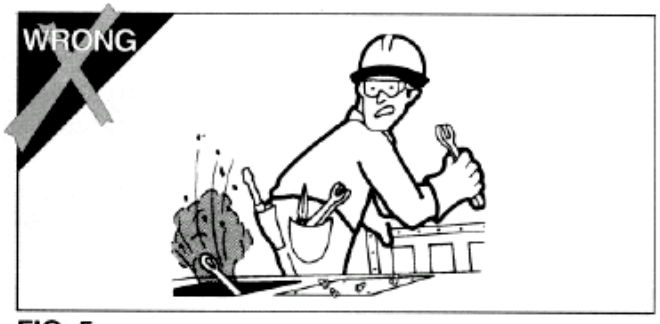


FIG. 5

EXHAUST FUMES

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension. If you do not have an exhaust pipe extension, be positive the area is adequately ventilated.

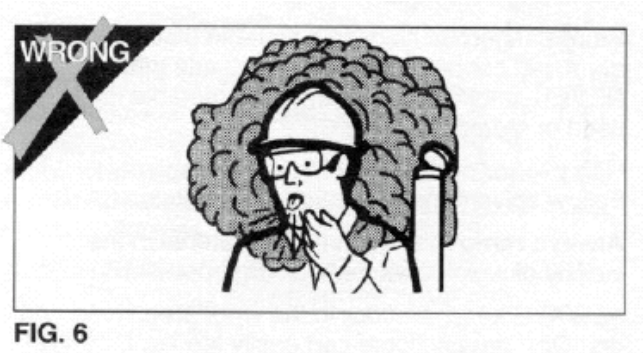


FIG. 6

HEAVY PARTS

Handle tools and heavy parts sensibly – with regard for yourself and other persons. Lower items – don't throw or drop them.

ALWAYS use proper hoisting equipment for lifting heavy loads. ALWAYS. Use a back brace when lifting by hand.

FIRE PREVENTION

Whenever possible use a non-flammable solvent to clean parts. Do not use gasoline or other fluids that give harmful vapors. If flammable fluids, such as gasoline or diesel fuel, must be used, extinguish open flames or sparks and DO NOT smoke.

Store dangerous fluids in a suitable place, in approved containers, which are clearly marked. NEVER smoke in areas where flammable fluids are used or stored. (FIG 7)

Use proper non-flammable cleaning solvents. Follow solvent manufacturer's instructions for use.

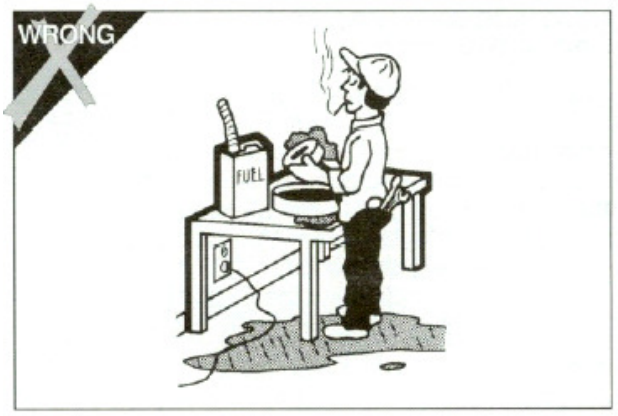


FIG. 7

PREPARE FOR SAFE OPERATION

LEARN TO BE SAFE

NEVER operate a pump which is new to you without first being instructed in its proper operation. READ the operator's manual. If one has not been provided. GET ONE AND STUDY IT BEFORE OPERATING THE PUMP.

Know the meaning of all identification symbols on your control and gauges. (FIG 8) Know the location of the emergency shut-down control if the machine is so equipped.

Before attempting to operate the pump, know the capabilities and limitations of the pump. Familiarize yourself with controls and instruments – their locations and functions.

Keep hands, levers and knobs clean of oil or grease to prevent slipping. Carefully read and follow the instructions on all safety signs and decals

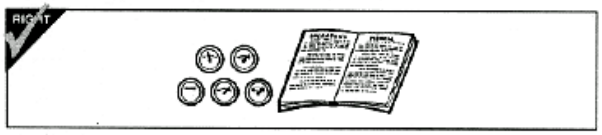


FIG. 8

CHECK IT OUT!

Know what safety devices your machine is equipped with and see that each item is securely in place and in operating condition. (FIG 9)

For example:
- Drawbar Coupling Chains and Pins
- Alarms and Warning Lamps
- Reflectors
- Guards and Shields
- Drain Covers, Plugs and Caps
- Shut-Down Devices
- Leveling Jacks
- Pressure Relief Devices
- Lifting Devices

FIG. 9

NEVER START OR OPERATE A PUMP KNOWN OR SUSPECTED TO BE DEFECTIVE OR MALFUNCTIONING

If your daily check uncovers any items that need attention – repair, replacement, or adjustment – report them promptly. The most minor malfunction could be the result of more serious trouble – or can cause it, if pump is operated. When in doubt, attach an OSHA Lockout/Tagout device tag to the control panel to disconnected electrical power supply at breaker, on electrically driven pumps and disconnect the battery and/or spark plug wire on engine driven pumps.

WORK SAFELY – PUMPS IN GENERAL

SAFE WORKING PROCEDURES

USE COMMON SENSE! Most accidents can be avoided by using common sense and concentrating on the job to be done.

ONLY EXPERIENCED AND QUALIFIED personnel should install and operate pump equipment.

KNOW THE PROPER starting procedure for your equipment. Follow the manufacturer's operation manual to the letter.

DO NOT operate a pump without all guards and shields in place. If OSHA required guards are damaged or misplaced, contact the manufacturer for replacement.

When **lifting pump** use only lifting equipment in good repair and with adequate capacity. Follow manufacturer's lifting recommendation.

Check all lubricant levels before pump installation in accordance with manufacturer's maintenance programs.

Keep hands and feet clear of moving parts. DO NOT stick fingers into a pump when in operation. Check suction strainer and hose regularly for proper submergence and to be sure it is free of obstructions.

NEVER operate a self-priming pump unless the volute is filled with liquid. The pump will not prime when dry.

PUMP only liquids for which the pump has been designed to handle.

DO NOT pump flammable, corrosive or caustic materials unless the pump and piping are explicitly designed for that purpose.

A pump should not be operated against a closed valve or other no flow conditions. Refer to the pump manufacturer's recommended practice for start-up, operation and shut-down procedures. **DO NOT** close down or restrict a discharging hose. **Be careful** of discharge hose whipping under pressure.

MAKE CERTAIN that whatever is to be connected to the pump is not subjected to pressures greater than those given in the manufacturer's instructions.

MAKE CERTAIN all connections are securely made and hoses under pressure are secured, with appropriate safety devices, to prevent whipping.

BE AWARE OF LIGHTNING. Stay clear of the pumping equipment during electrical storms. It can attract lightning. (FIG 10)

OVERHEATING PRECAUTIONS

Overhead pumps can cause severe damage to the equipment and can cause severe physical burns and injury.

Operating a pump with the suction and/or discharge valve closed is a principal cause of overheating. Approach cautiously any pump that has been in operation.

DO NOT remove hoses from a pump until the system is properly cooled to ambient temperature.

DO NOT remove the cover plate or drain plugs from any overheated pump. Allow the pump to cool. Check pump temperature before opening fill port or drain plug.

If overheating of the pump casing occurs:
- **STOP** the pump immediately
- Allow the equipment to **cool completely**
- Slowly and cautiously **vent the pump**
- **Refer to the manufacturer's instruction** manual before restarting the unit
- Remove hoses carefully. Heated water can be in hoses and static head produces pressure.

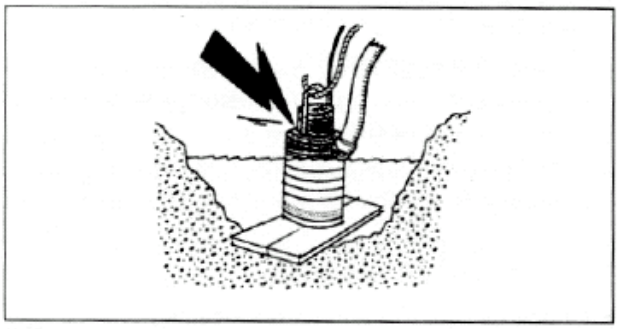


FIG. 10

BEFORE STARTING

Check the pump thoroughly at delivery for any shipping damage.

Locate the pump in an accessible location, as close to the liquid as possible.

Secure the pump after it is placed in its intended operating position so it does not tip, roll, slide or fall.

IMMEDIATELY ON STARTING THE PUMP

Observe gauges, instruments and warning lights to ensure that they are functioning and their readings are within the normal operating range.

- Be sure the immediate work area is safe for operation
- Operate control; make certain all operate properly and "feel" right. Accustom yourself to the "feel" of the equipment
- Listen for any unusual noises, smell for any unusual odors; look for any signs of trouble
- Be sure to open all manual valves slowly to prevent WATER HAMMER
- Check all warning and safety devices and indicators.
- If safety-related defects or malfunctions are detected, SHUT DOWN the equipment. Correct the problem, or notify your supervisor. DO NOT OPERATE EQUIPMENT WITH DEFECTS
- **If an unsafe condition cannot be remedies immediately, notify your supervisor and tagout/lockout** the pump on the start switch and/or appropriate, prominent location. (FIG 11)

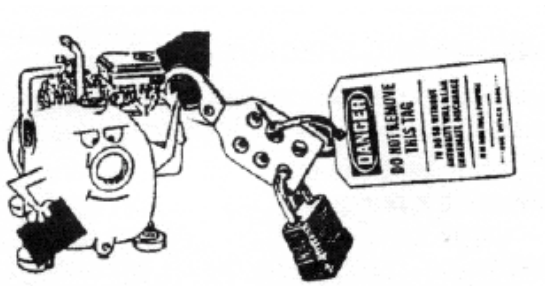


FIG. 11

WORK SAFELY – ENGINE DRIVEN PUMPS

Do not jump start engine battery.

When operating internal combustion engines in an enclosed area, always make provisions to pipe exhaust fumes to the outside.

EXHAUST FUMES CAN KILL. Do not operate engine driven pump equipment in a confined or enclosed space without adequate ventilation.

Exhaust gases are odorless and deadly poison.

DO NOT TOUCH: The exhaust system components get very hot and stay hot for some time after shutting the engine off.

Follow engine manufacturer's instructions explicitly on hand cranking.

Do not shut down high head pumps quickly:
1. Throttle back slowly
2. Open by-pass line
3. Should have a check valve
4. Slowly close gate valve on discharge if so equipped

Check for fuel, oil and hydraulic fluid leaks, worn and damaged hoses/lines or power cables.

Refueling:

When refueling, the following precautions must be followed:
- Add fuel of proper type and grade, only when the pump is not running and engine is cool
- Fuel in well ventilated area
- Turn off all electrical switches
- Keep lighted smoking materials, flames or spark producing devices at a safe distance while refueling
- Keep fuel nozzle in contact with tank being filled, or provide a ground to prevent static sparks from igniting fuel

- **Do not spill fuel on hot surfaces**
- Clean up spillage immediately
- Do not start engine until fuel cap is secured to the fuel tank
- **Always** make sure that fuel is being put in the fuel tank, motor oil in the proper location and hydraulic oil into hydraulic oil reservoirs

Maintenance and Repair:

All installations, operations and maintenance should be in accordance with pump and engine manufacturer's recommended operation and maintenance program. These manuals should be kept available with the equipment.

Maintenance work can be **hazardous** if not done in a careful manner. All personnel should realize the hazards and strictly follow safe practices.

NEVER perform any work on the equipment unless authorized to do so.

BEFORE ANY maintenance **work** is to be done, a LOCKOUT/TAGOUT standard device and procedure should be implemented. Prior to removal of LOCKOUT/TAGOUT, the equipment must be fully operational and all personnel accounted for. Except in cases of emergency, the removal of the LOCKOUT/TAGOUT should be done ONLY by the initiating person prior to the return to start-up (see Section 3, Page 5, FIG 11)

BEFORE doing any major work, disconnect the ignition and battery if so equipped. **Always replace** safety devices removed during service or repair before returning pump to operation.

Battery Servicing:

- **Always wear** safety glasses and gloves when servicing or working with batteries.
- **Before servicing battery,** turn off electrical systems, then disconnect ground terminal clamp. Before installing a battery, turn off electrical equipment, then connect the battery ground clamp **last.**
- **Maintain** electrolyte at the recommended level. Check level frequently. Add distilled water to batteries only when starting up, never when shutting down.
- **Use a flashlight** to check level. **NEVER** use a flame
- **Do not short** across battery terminals – the spark could ignite the battery gases.

Battery acids will **burn skin,** eat holes in clothing, and can **cause blindness** if splashed in eyes.

If you spill acid on yourself flush skin immediately with lots of water. Apply baking soda to help neutralize the acid. ***If acid gets into the eyes, flush immediately with large amounts of water and seek proper medical treatment immediately.***

WORK SAFELY – ELECTRIC MOTOR DRIVEN PUMPS

Follow motor manufacturer's recommended maintenance and operation instructions.

If circuit breaker or fuse is stripped, examine the system for the problem before restarting pump.

NEVER use the power cord to aid lifting the pump.

NEVER operate a pump with a plug-in type power cord without a ground fault circuit interrupter.

NEVER use cords with frayed, cut or brittle insulation. Check the cord on the pump for nicks in the insulation and for sound connections to the ground fault interrupter plug and motor.

NEVER let extension cords or the plug connections lay in water. Locate the pump so that the cord cannot fall into any water or be submerged by rising water, unless the pump is designated for such use.

NEVER handle energized power cords with wet hands

MOTOR OVERLOAD: do not exceed the manufacturer's recommendation for maximum lift or discharge head. See manufacturer's published curve for proper sizing of motors. A misapplied motor can overheat.

Pump Maintenance and Repair:

MAKE SURE the pump is disconnected from the power source or the appropriate circuits are dead and OSHA Lockout/Tagout is applied before doing any maintenance or repair work on the pump.

Maintenance work can be **hazardous** if not done in a careful manner. All personnel should realize the hazards and strictly follow safe practices.

NEVER perform any work on the equipment unless authorized to do so. (FIG 11) Before performing any maintenance or repair work, consult the manufacturer's instruction manual for recommended procedures.

Pumps with float switches or other automatic devices can start without warning if not properly locked out.

BEFORE ANY maintenance **work** is to be done, a LOCKOUT/TAGOUT standard device and procedure should be implemented. Prior to removal of LOCKOUT/TAGOUT, the equipment must be fully operational and all personnel accounted for. Except in cases of emergency, the removal of the LOCKOUT/TAGOUT should be done ONLY by the initiating person prior to the return to start-up.

ALWAYS replace safety devices removed during the service or repair before returning pump to operation.

NEVER use the power cord to aid in lifting the pump.

Sizing Extension Cords:

Use the following chart to select the correct size extension cord to prevent excessive amperage draw or voltage drop, which would cause the motor to overheat. **Cables that are too long or coiled** can cause a voltage drop. **Be aware** that strong sunlight can cause a voltage drop.

	Wire Gauge and Cord Length (in feet)		
Amperes	50	100	150
6	16	16	14
8	16	14	12
10	16	14	12
12	14	14	12
14	14	12	10
16	12	12	10

SAFE WORKING PROCEDURES

***ALLOW only qualifies personnel* to INSTALL, WIRE and OPERATE** submersible pumps

Whenever electricity is present there is the possibility of **electrocution.**

NEVER use a pump/motor in an explosive atmosphere if it is not exclusively designed for that application.

ALWAYS ground the pump.

Make certain to connect the pump to the right phase and voltage.

DO NOT run the pump if voltage is not within limits. **Make all electrical installations** in accordance with National Electric Code, State and Local electric codes.

Mount electrical control box in a vertical position protected from the elements.

NEVER attempt to use the power cord or hydraulic hoses as a lifting or lowering device for submersibles. Attach a lifting cable to the manufacturer's recommended attachment point on the pump for lowering and lifting the pump. (FIG 12)

NEVER position the pump directly on a soft, loose bottom. To attain maximum capacity and prevent excessive wear, position the pump so it will not burrow itself into sand or clay. Stand the pump in a plank, a bed of coarse gravel, within a perforated container, on a suitable flotation device, or retain it hanging freely by a lifting cable. (FIG 13)

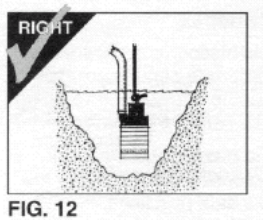


FIG. 12

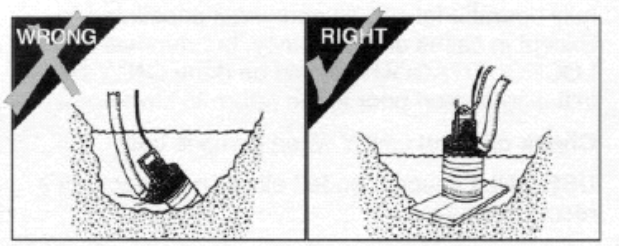


FIG. 13

Pump Maintenance and Repair:

MAKE SURE the pump is disconnected from the power source or the appropriate circuits are dead and OSHA Lockout/Tagout is applied before doing any maintenance or repair work on the unit.

Maintenance work can be **hazardous** if not done in a careful manner. All personnel should realize the hazards and strictly follow safe practices.

NEVER perform any work on the equipment unless authorized to do so. Before performing any maintenance or repair work, consult the manufacturer's instruction manual for recommended procedures.

BEFORE ANY maintenance **work** is to be done, a LOCKOUT/TAGOUT standard device and procedure should be implemented. Prior to removal of LOCKOUT/TAGOUT, the equipment must be fully operational and all personnel accounted for. Except in cases of emergency, the removal of the LOCKOUT/TAGOUT should be done ONLY by the initiating person prior to the return to start-up.

Check oil level ONLY when pump is cool.

USE ONLY recommended oil per manufacturer's recommendation.

INSPECT ELECTRICAL WIRING for worn or damaged insulation. **INSTALL** new wiring if wires are damaged. **After repairs are made, clean the equipment before putting the pump back into position.**

FINAL WORD TO USER

Remember that **YOU are the key to safety**. Good safety practices not only protect you but also protect the people around you.

You have read this safety manual and the manufacturer's manual(s) for your specific pump. Make them a working part of your safety program. Keep in mind that this safety manual is written for this type of equipment.

Practice all other usual and customary safe working precautions, and above all –

REMEMBER
SAFETY IS UP TO YOU

YOU CAN PREVENT SERIOUS
INJURY OR DEATH

REFERENCES

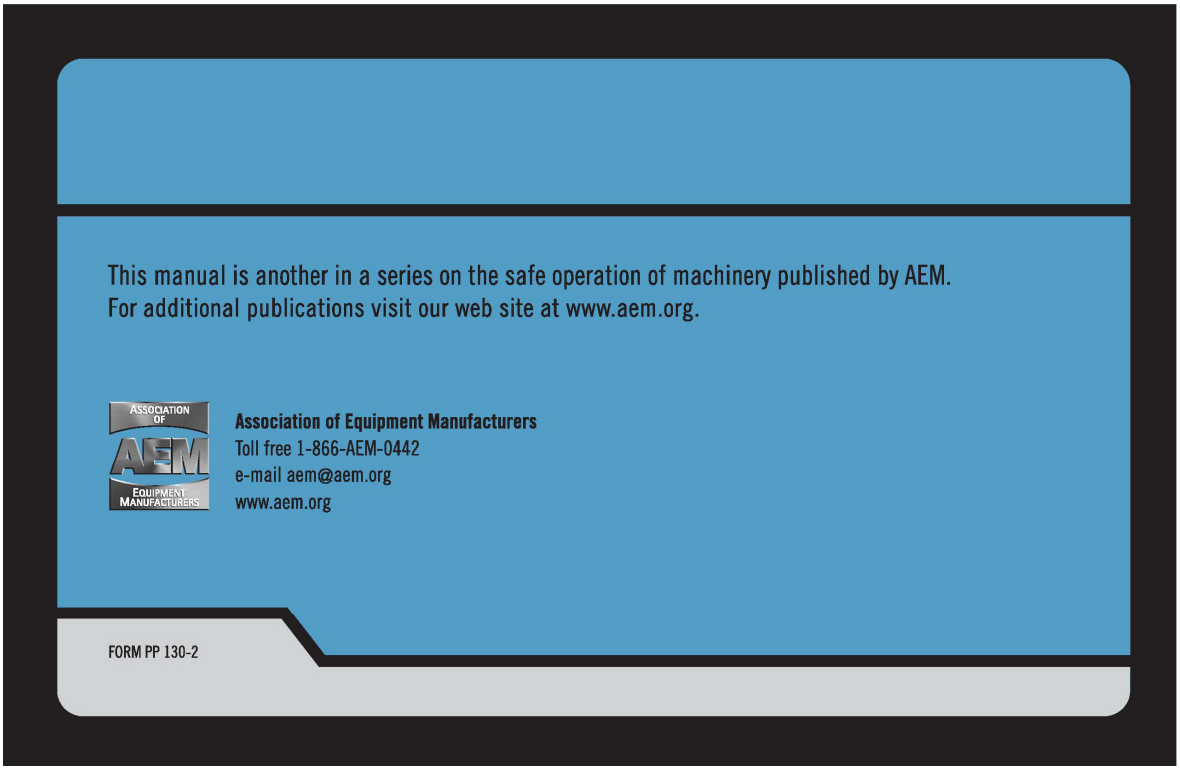
The following is a partial list of referenced material on safe operating practices:

U.S. Department of Labor publishes safety and health regulations and standards under the authority of the Occupational Safety and Health Act for the general construction and mining industries.
U.S. Department of Labor
Washington, DC 20210

NFPA – National Fire Protection Association
P.O. Box 9101
1 Battery March Park
Quincy, MA 02269-0101

SAE – Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15096
Publishes a list, “Operator Precautions” SAE J153 May 87.

AEM – Association of Equipment Manufacturers
111 East Wisconsin Avenue
Milwaukee, WI 53202


This manual is another in a series on the safe operation of machinery published by AEM.
For additional publications visit our web site at www.aem.org.
ASSOCIATION OF
AEM
EQUIPMENT MANUFACTURERS
Association of Equipment Manufacturers
Toll free 1-866-AEM-0442
e-mail aem@aem.org
www.aem.org
FORM PP 130-2

CONDITIONS OF SALE

This **LIMITED WARRANTY** is extended only to the original consumer/purchaser of products manufactured by Thompson Pump & Mfg., Co., Inc., P.O. Box 291370, Port Orange, Florida, 32129-1370. Telephone number: 386-767-7310.

Thompson Pump & Mfg., Co., Inc, hereinafter referred to as "Thompson", warrants the products it manufactures to be free of defects in materials and workmanship. The warranty extends only to the original consumer/purchaser, hereinafter referred to as "Consumer", and commences on the date of sale to said Consumer and remains in effect for a period of twelve (12) months.

THIS WARRANTY DOES NOT COVER:

a. Adjustment or replacement of maintenance items and wear parts, such as but not limited to, seals, bearings, lubrication and filters.
b. Any work performed to correct malfunction caused by misuse, negligence or disregard of Thompson's written instructions concerning installation, operation and maintenance of its products.
c. Additional service work performed above that which is required to satisfy warranty requirements.
d. Transportation charges, haul-out, travel time, loss of use, or other consequential charge or damage.
e. Any damage caused by sand or abrasive materials, chemical deposits, corrosion, hazardous waste or material, acts of God or other outside forces beyond the control of Thompson.
f. Engines, electric motors and other items not of our manufacture. Warranty on those items, if any, is the warranty of the manufacturer of such items.
g. Repairs or replacement made without authorization from Thompson or repairs made other than at a service facility designated by Thompson.
h. Delivery schedules are not covered by any warranty terms, and all dates given are approximate and subject to change without notice.

In the event of any breach of the warranty, the original Consumer must deliver or ship the defective unit or parts, freight prepaid, to the factory or any of the Thompson authorized parts and service centers, providing prior permission is obtained from the factory. Thompson agrees that it will replace or repair (at our option) any such unit or parts where the defect results from a breach of its warranty without charge to the original Consumer, provided said defect occurred within the warranty period. Thompson or the authorized service repair centers will not be responsible for the cost of the units or parts and the shipment of said unit or parts to or from Thompson's plant or service centers.

Thompson's warranty obligation with regard to equipment not of its own manufacture is limited to the warranty actually extended to Thompson by its suppliers. Should a failure of such motor or engine occur during the warranty period, the original Consumer must notify Thompson Pump & Mfg., Co., Inc., Port Orange, Florida and follow the instructions given. THIS WARRANTY DOES NOT COVER REPAIRS OR REPLACEMENT MADE WITHOUT NOTIFICATION TO THOMPSON PUMP & MFG., CO., INC.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND OF ANY OTHER OBLIGATION ON THE PART OF THE SELLER. NO AGENT, EMPLOYEE OR REPRESENTATIVE OF THE SELLER HAS ANY AUTHORITY TO BIND THE SELLER TO ANY AFFIRMATIONS, REPRESENTATION OR WARRANTY CONCERNING THE PRODUCT SOLD UNDER THIS WARRANTY. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. IMPLIED WARRANTIES, WHEN APPLICABLE, SHALL COMMENCE UPON THE SAME DATE AS THE EXPRESS WARRANTY ABOVE AND SHALL, EXCEPT FOR WARRANTIES OF TITLE, EXTEND ONLY FOR THE DURATION OF THE WARRANTY.

Some states do not allow limitations on how long the implied warranty lasts, so the above limitations may not apply to you. The only remedy provided to you under an applicable implied warranty or the express warranty shall be the remedy provided under the express warranty, subject to the terms and conditions contained therein.

Thompson Pump & Mfg., Co., Inc., shall not be liable for incidental or consequential loses and damages under the express warranty, any applicable implied warranty or claim for negligence, except to the extent that this limitation is found to unenforceable under applicable state law.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

For more information, contact the Thompson Pump Service Department at (800) 767-7310

Warranty Policy Definitions

Warranty – a warranty is defined as a guarantee, written by the manufacturer, which assures the integrity of a product in respect to its performance, reliability, and durability during specified period of time (see Limited Warranty). Warranty is intended to protect the consumer from a faulty product. However, it should be clearly understood that the bilateral communication associated with warranty provides the manufacturer with the necessary information required to institute design, manufacturing, or quality control improvements, which are intended to result in an improved product line.

Material Defect – a material defect is an inherent flaw in the material, often undetectable until its flaw causes a failure due to the part being unable to perform its normal function. Examples of a material defect would include incorrect raw material or casting defects.

Defective Workmanship – relates to the improper assembly of the pump, or any of its sub-assemblies, or to the dimensional incorrectness of any of the components. Examples of defective workmanship would include misalignment, incorrect bolt tightening, incorrect assembly, or the absence of a correct or required component.

Sales Policy or Goodwill Adjustments - from time to time the company will issue Sales Policy adjustments as a settlement, which Thompson may make, as its option, which are beyond the scope of the Thompson Limited Warranty policies and which are not necessarily related to either a material defect or improper workmanship. This type of settlement is generally regarded as a public relations instrument.

Warranty Approval / Rejection

In all cases, Thompson Pump reserves the right to approve, reject or partially approve a warranty claim. The Thompson Warranty Department will provide to the best of its ability a failure analysis decision within 30 days of receipt of the completed claim. It must be understood that the Thompson Pump Warranty Department will evaluate and assess all warranty claims. All warranty approvals will be based upon our standard warranty policy.

A **detailed** Warranty Claim Form must be submitted to the Thompson Pump Warranty department within 10 days after the failure occurs. The Warranty Claim Form must be complete and accurate when it is submitted to Thompson Pump.

All damaged parts must be retained and returned to Thompson Pump if and when requested.

In cases where the full or partial amount of a warranty claim is approved a copy of the approved warranty claim will be returned with an evaluation letter and a credit memo for the appropriate parts, labor and mileage.

Labor will be reimbursed to the distributor for labor hours in accordance with Thompson Pump's established repair policies set by the Warranty Department. Thompson Pump will reimburse the distributor at a rate for a single mechanic equal to 75% of the distributors straight time (flat) shop rate not to exceed $ 45.00 per hour.

Should a warranty repair take place in the field, Thompson Pump will reimburse the distributor for labor costs as noted above and mileage. The distributor must notify Thompson Pump prior to repairing the equipment at which time the Thompson Warranty Department will authorize in writing, the field repair. Thompson Pump will reimburse the distributor at a rate of $ 1.00 per round trip mile, which includes the labor costs of the driver/mechanic.

Thompson Pump will provide replacement parts to affect a warranty repair at no charge to the Distributor or the Consumer.

If the parts used for a warranty repair are supplied from the Distributor's stock, Thompson Pump will provide the replacement parts at no charge or a credit will be issued to the Distributor for the Distributor's normal cost plus an additional 10% discount allowed.

Thompson Pump does not warrant equipment or parts that are not of its manufacture but which are required in the production of a complete pump unit or accessory and any such claims must be filed with the appropriate manufacturer. Examples of equipment or parts not of Thompson Pump's manufacture are, but are not limited to, engines, air compressors, vacuum pumps, drive couplings, wheels and tires, and axles.

All parts for rejected warranty claims will be invoiced at standard list price less any applicable discount.

For more information, contact the Thompson Pump Service Department at (800) 767-7310

Effective: 11/15/02 jjf

Bill of Materials

QTY	PART NUMBER	DESCRIPTION
1	C98-5487-001	NAME PLATE, TPM SER.NO., SILVER/BLUE
1	C98-LABL-016	LABEL, DIESEL FUEL ONLY
1	C98-LABL-200	LABEL, OPERATOR'S LIABILITY NOTICE
1	C98-LABL-036	LABEL, WATER DRAIN 1 X 2"
1	C98-LABEL-01	LABEL, DO NOT PUMP VOLATILE, FLAMMABLE,
1	C98-LABL-018	LABEL, FILL WITH WATER BEFORE USING
0.125	C89-DUP-AK	PAINT, YELLOW LEAD FREE #224AK
1	M54-BC-POS-23T	CABLE, RED BATTERY, 2T/3T,
1	M54-BC-NEG-23T	CABLE, BATTERY, 2T/3T, NEG
4	H61-0001-017	WASHER, FLAT 1/4 SAE
2	HA-HCS-25C-100-5Z	HEXHEAD CAPSCREW 1/4-20X1 ZINC
2	HA-NYN-25C-2Z	LOCK NUT, 1/4"-20 NYLOCK USS ZINC
1	M54-9U1L	BATTERY, 12 VOLT,320 AMP,CAP. SMALL
1		ENGINE, DIESEL
1	Q14-3000-TS3002	ADAPTOR, PILOT 3T/15LD350
1	Q14-3000-TS3001	SLEEVE, SHAFT 3T/15LD350
1	Q14-TL001/32	NUT, JAM, 3/8" SAE, S.S.
1	Q14-TL002/32	STUD, IMPELLER, SS, FOR 3T/4T
1	K08-TW0829-C1	3T-DL-15LD SQ. TUBING FRAME
1	P14-3TL8.5	PUMP END, 3" TRASHLIB FOR 8.5HP
2	W67-0001-089F	NIPPLE, 3" X CLOSE NPT FACED
2	H62-0001-056	HHCS, 10M-1.5-25M
2	H62-0001-019	WASHER, LOCK 10M
6	H62-0001-018	WASHER, LOCK 8M
6	H62-0001-003	NUT, HEX 8M X 1.25
8	H61-0001-019	WASHER, FLAT 3/8 SAE
4	H60-0001-056	HHCS, 3/8x1-1/4 GR 5 PLT NC
4	HA-NYN-375C-2Z	LOCK NUT, 3/8"-16 NYLOCK
6	F38-68325-YB9-000	ISOLATOR, FOR HONDA ENGINE

Parts Order Form

IMPORTANT!

To expedite orders and lessen mistakes, it is recommended that a fax be sent with the following information:

Name: _____ Title: _____

Company:_____

Address: _____

City: _____State: _____Zip:_____

Phone: (_____)_____ Fax: (_____)_____

E-mail address: _____

Unit Serial Number: _____ {**VERY IMPORTANT**}

List of parts by part number, description, and quantity

If the part numbers (s) are unknown, please give as full a description as possible, so that we may expedite your shipment.

FAX NUMBER: 386-761-4498

e-mail: partssales@thompsonpump.com

Phone Number (Toll Free):888-421-7185

Gary Peake	Nellie Morris	Steve Seymour
Parts Sales	Parts Sales	Parts Sales
Ext. 4161	Ext. 4172	Ext. 4160

4620 City Center Dr. Port Orange, Fl 32129-1370 Phone: 800-767-7310

$20.00 MINIMUM ORDER

Manual Registration Form

IMPORTANT!

Please provide the information requested below so that we can automatically update manual information as revisions occur.

Name: _____ Title: _____

Company:_____

Address: _____

City: _____State: _____Zip:_____

Phone: (_____)_____ Fax: (_____)_____

Unit Serial Number: _____

Type of Pump: _____ Serial Number _____

E-mail address: _____

Revised documents will be e-mailed when available. At Thompson Pump's discretion, revised documents will be batched and distributed on CD.

Please return to Thompson Pump, Attention: Engineering Department.

Thompson Pump & Manufacturing Co., Inc.

4620 CITY CENTER DRIVE
P.O. BOX 291370
PORT ORANGE, FLORIDA, USA, 32129
www.thompsonpump.com

MAIN OFFICE: PHONE: (800) 767-7310 FAX: (386) 767-4753

PARTS DEPARTMENT: PHONE: (888) 421-7185 FAX: (386) 761-4498

Jerry Tarnow, Parts Sales Mgr. (386) 944-4110 jtarnow@thompsonpump.com

SERVICE DEPARTMENT: PHONE: (800) 761-7310 FAX: (386) 767-4753

Bill Crooms, National Service Mgr. (386) 944-4139 bcrooms@thompsonpump.com

FT. MYERS SERVICE CENTER:
5491 Division Drive, Ft. Myers, FL 33905
TOLL FREE: (877) 689-7634
PHONE: (239) 690-0600
FAX: (239) 690-0904

WEST COAST OFFICE:
504 South 70th Street, Kansas City, KS 66111
PHONE: (816) 935-5311
FAX: (913) 788-5568

NEW ENGLAND BRANCH:
21 Arnold Farm Rd, W. Greenwich, RI 02817
PHONE: (401) 397-4950
FAX: (401) 397-4980

JACKSONVILLE SERVICE CENTER:
6743 Greenland Industrial Blvd
Jacksonville, FL 32258
TOLL FREE: (800) 767-7305
PHONE: (904) 292-4883
FAX: (904) 262-5183

SAVANNAH SERVICE CENTER:
125 Westside Blvd, Pooler, GA 31322
TOLL FREE: (800) 767-8507
PHONE: (912) 330-0233
FAX: (912) 330-0280

CHARLESTON SERVICE CENTER:
120 Jed Park Place, Summerville, SC 29483
TOLL FREE: (800) 767-7309
PHONE: (843) 879-0393
FAX: (843) 879-0397

ORLANDO SERVICE CENTER:
706 W. Landstreet Road, Orlando, FL 32824
TOLL FREE: (800) 767-7304
PHONE: (407) 812-4007
FAX: (407) 812-4030

BATON ROUGE SERVICE CENTER:
18394 Tom Dr, Hammond, LA 70403
TOLL FREE: (800) 510-5649
PHONE: (985) 321-0070
FAX: (985) 321-0074

CHESAPEAKE VIRGINIA BRANCH:
1321 Victory Blvd., Chesapeake, VA 23323
TOLL FREE: (800) 767-7307
PHONE: (757) 485-4690
FAX: (757) 485-4779

PANAMA CITY SERVICE CENTER:
1619 Florida Ave., Lynn Haven, FL 32444
PHONE: (850) 277-0445
FAX: (850) 277-0120

MARYLAND SERVICE CENTER:
38190 Old Stage Rd Unit A, Delmar DE 19940
PHONE: (302) 907-0292
FAX: (302) 907-0532

MYRTLE BEACH SERVICE CENTER:
157 Winyah Road, Conway, SC 29526
PHONE: (843) 347-5532
FAX: (843) 347-5542

PENSACOLA SERVICE CENTER:
3310 McLemore Drive, Pensacola, FL 32514
TOLL FREE: (800) 767-7313
PHONE: (850) 478-2833
FAX: (850) 479-4349

KANSAS CITY BRANCH:
504 South 70th Street, Kansas City, KS 66111
PHONE: (913) 788-2583
FAX: (913) 788-5568

ATLANTA GEORGIA BRANCH:
1481 Dogwood Dr, Conyers GA 30012
PHONE: (678) 382-0151
FAX: (678) 382-0153

SARASOTA SERVICE CENTER:
6851 26th Court East, Sarasota, FL 34243
TOLL FREE: (800) 767-7312
PHONE: (941) 755-3177
FAX: (941) 753-8618

JACKSON MISSISSIPPI BRANCH:
2110 Hwy 49 S., Florence, MS 39073
TOLL FREE: (800) 767-7314
PHONE: (601) 932-4916
FAX: (601) 932-4918

BALTIMORE BRANCH:
7527 Montevideo Rd, Jessup, MD 20794
PHONE: (410) 799-0451
FAX: (410) 799-0454

WEST PALM BEACH SERVICE CENTER:
15935 Assembly Loop, Jupiter, FL 33479
TOLL FREE: (800) 767-7311
PHONE: (561) 624-7801
FAX: (561) 624-7803

GOLDSBORO NORTH CAROLINA BRANCH:
2963 U.S. 13 North, Goldsboro, NC 27534
TOLL FREE: (800) 767-7308
PHONE: (919) 778-2743
FAX: (919) 778-7335

Warranty Registration Form

IMPORTANT!

Please note that to receive warranty coverage, the pump unit must be registered for warranty upon receipt by the owner**.** Please provide the information requested below.

Name: _____ Title: _____

Company:_____

Address: _____

City: _____State: _____Zip:_____

Phone: **(_____)**_____ Fax: (_____) _____

DATE PURCHASED: **November 16, 2011**

Unit Serial Number: **3T-DKW-xxx**

Type of Pump: **3" Trash Pump**

Serial Number _____

E-mail address: _____

Revised documents will be e-mailed when available. At Thompson Pump's discretion, revised documents will be batched and distributed on CD.

PLEASE FILL IN FORM AND MAIL THIS WARRANTY REGISTRATION FORM UPON RECEIPT
MAIL TO: THOMPSON PUMP, P.O. BOX 291370, PORT ORANGE, FL, USA, 32129

ORDER#